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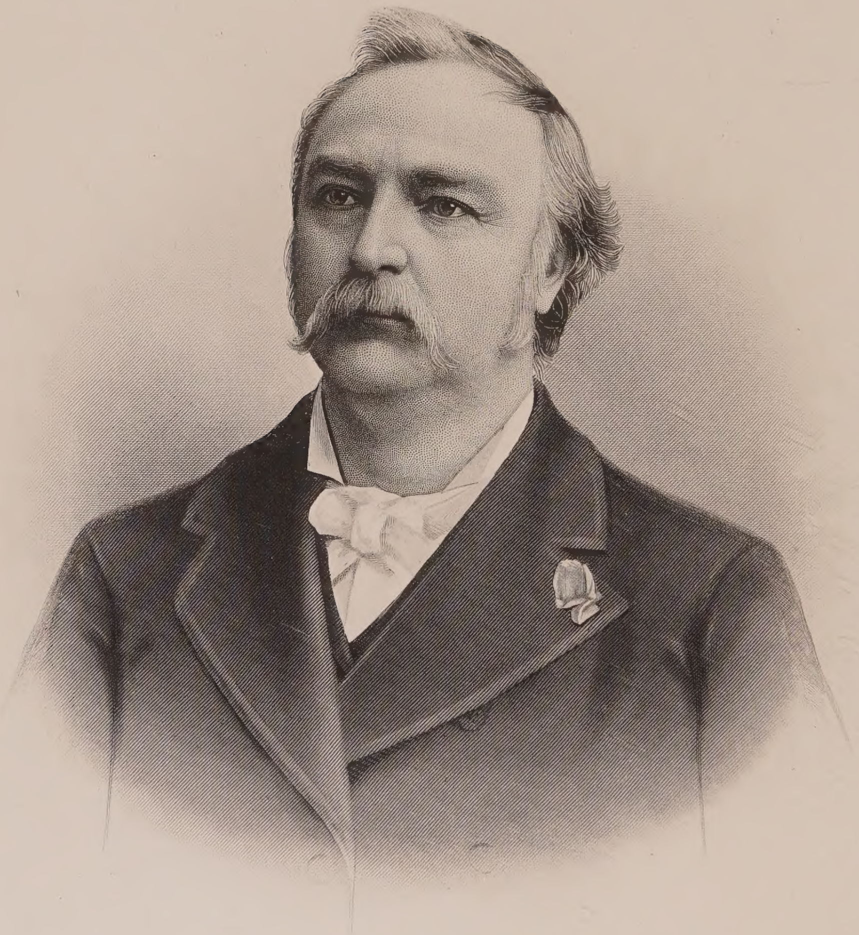

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CLINICAL LECTURES

ON

ABDOMINAL SURGERY

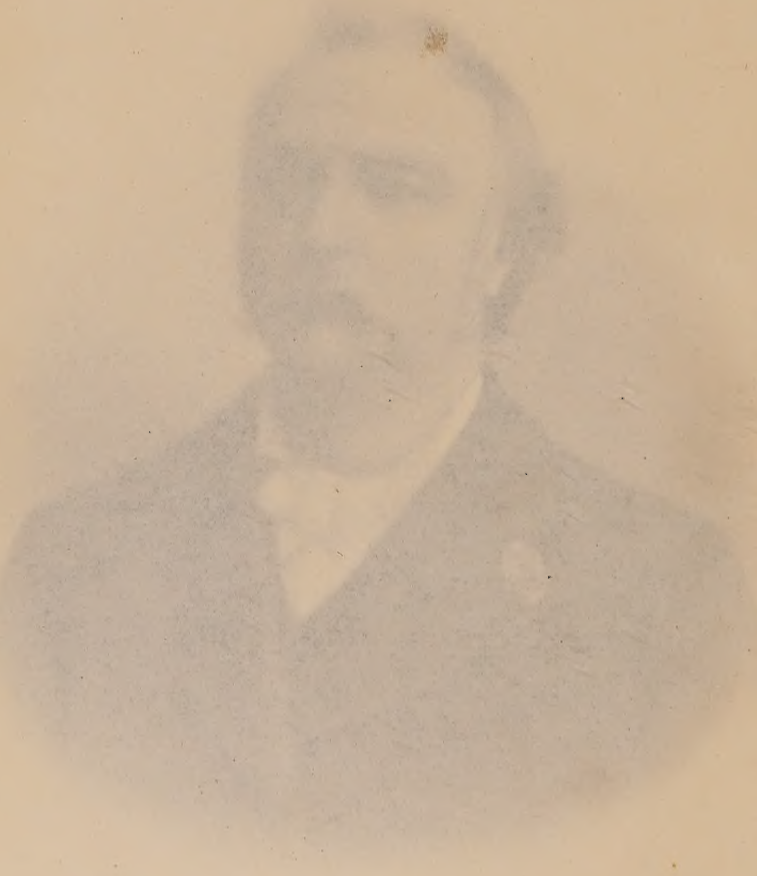
AND OTHER SUBJECTS,

BY

CHARLES T. PARKES, A.M., M.D.,

Late Professor of Surgery, Rush Medical College, Surgeon
to the Presbyterian Hospital, Surgeon in Charge of
St. Joseph's Hospital, Surgeon in Charge of
Michael Reese Hospital, Consulting Surgeon
Hospital for Women and Children,
Etc., Etc.

EDITED BY DR. A. J. [illegible]



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TO THE PRESBYTERIAN HOSPITAL, SURGEON IN CHARGE OF
ST. JOSEPH'S HOSPITAL, SURGEON IN CHIEF OF
AUGUSTANA HOSPITAL, CONSULTING SURGEON
HOSPITAL FOR WOMEN AND CHILDREN,
ETC., ETC.

EDITED BY DR. A. J. OCHSNER.

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PREFATORY NOTE.

I desire here to tender my grateful acknowledgments to Dr. A. J. Ochsner, a former pupil and clinical assistant of my departed husband, Doctor Charles T. Parkes, for his kind assistance in arranging the matter herein for publication, and for correcting the proof sheets.

I trust this may prove helpful to the younger members of his noble profession, and that to his former pupils, it may serve as a memento of an honored and beloved teacher.

He cherished a worthy ambition to contribute to the art of surgery a work of his own authorship, and assiduously sought to prepare and qualify himself to that end. Such an achievement would have constituted, to him, the crowning glory of his life. As for his capabilities for such a task, let those who labored with him judge.

"I care not in these fading days
  To raise a cry that lasts not long,
  And 'round thee, with the breeze of song,
To stir a little dust of praise."

I. J. P.

PREFACE.

Since Professor Parkes' early and unexpected death, many of his pupils and friends have expressed a wish to secure a collection of reports of his clinical lectures, and it is in response to these requests that this book has been compiled. These lectures were all delivered extemporaneously, and the work has been compiled mostly from stenographic notes, taken by Dr. F. M. Crane, one of the students of the Rush Medical College during the last two years of the author's life.

The volume comprises lectures on Abdominal Surgery, containing the results of the author's vast experience in this department; a paper on The Treatment of Gun-shot Wounds of the Small Intestines, based upon a series of experiments on dogs; it also contains short clinical lectures upon almost every subject in Surgery.

From ten to twenty patients were present for treatment at each clinic, consequently only the important practical facts could be dwelt upon—the theoretical discussion being reserved for the three didactic lectures which the author delivered each week.

In order to illustrate the amount of work which had to be performed during one session, the stenographic report of one entire clinic has been added as an appendix.

Most of the cases considered were referred to the clinic by alumni of the college. Their initials and addresses have been preserved for the purpose of identification.

It is, of course, plain that these papers are not nearly so complete or comprehensive as they would be had they been written by the author for publication, or even had he revised the stenographic reports of the extemporaneous lectures.

Care has been taken to preserve almost entirely the language used by the lecturer, because in this, it would seem, by reason of its force and charm, lie the special value and fascination of this work for his pupils and his friends.

DR. A. J. OCHSNER.

Feb. 22, 1896.

CHAPTER I.

ABDOMINAL TUMORS.*

Diagnosis.—The diagnosis of abdominal tumors is a subject which has for its object an inquiry into the best methods of discovering all of the characteristics of the many growths developing in connection with the different organs of the abdomen. While it is a fact that the majority of these growths may, in a measure, have their peculiarities somewhat readily determined, when they are moderate in size, and can be studied early in their history and development, it is also true that in the later stages, when they have reached immense size, obscuring and hiding all of the landmarks, nothing short of abdominal section with ocular inspection and digital demonstration will elicit their true connection and nature. Again it is true that not a few of them, even in their early history, present irregularities and peculiarities of development which put at naught the art and skill of the best diagnosticians. So that here in this field, as well as in all other fields of inquiry, if we desire to make ourselves ever ready to meet emergencies, familiarity with the subject can only come from constant reiteration, line upon line, and precept upon precept.

It is a fair proposition to state that he is the best diagnostician who has schooled himself to make a regular and systematic inquiry into every case presented to him for treatment. It is sometimes said that certain individuals possess a species of occult power, that they are intuitive diagnosticians. No man can excel as a diagnostician without severe, prolonged and persistent study of the rules of physical diagnosis.

Natural Topography of the Abdomen.

It seems to me best to call your attention, very briefly, to what is properly called the natural topography of the abdomen.

Individually, I have fallen into the habit of dividing the abdominal cavity into two general divisions by means of a transverse line drawn through the umbilicus, and this bisected by the median line gives four compartments. Above this transverse line, abdominal tumors, as a rule, are serious in character, examination is uncertain in its result, operative procedure accompanied by high mortality, and if surgical interference gives relief, it is apt *not* to be permanent. The exceptions to this statement are to be found in some tumors of the gall-bladder, cysts of the pancreas, and some abscesses and cysts of the liver. Below this line the majority of tumors are not serious in character, examination is more positive in its results; they are amenable to common treatment, mortality is not high primarily, and surgical interference gives permanent relief. The exceptions to this statement are some myomata and malignant tumors of the uterus and ovaries. It is scarcely necessary for me to impress upon you the necessity of being thoroughly familiar with the normal relations of the organs of the abdomen *in situ*, and their bearing upon abdominal growths affecting any one of them.

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* A lecture delivered before the Chicago Policlinic, April, 1890.

This includes the best possible information as to the size, density, shape, position, and the manner of locating them by the application of the rules of physical diagnosis. Again, there is a fact in connection with the abnormal growth developing in any one of the organs of the abdomen. It is this—the normal shape of the organ and the manner of its attachments determines in some degree the character of the development and the direction of the growth. This applies especially to fixed organs of the abdomen.

Furthermore it is very necessary to make one's self familiar with the character of the growths which pathological anatomy has determined to usually affect the different organs. As an illustration, we know that the liver is frequently the seat of the growth of hydatids, and that it is disposed to enlarge in the direction of the least resistance, *i. e.*, downward and forward.

The diseases of the kidney cause enlargement in the direction of the ilium as well as forward and inward. The spleen, however large, always displays the corrugated free margin.

HISTORY.

Much may be learned as to the nature of the growth from the history given by the patient in answer to inquiries as to the time when pain was first felt, its character, whether circumscribed or radiating, and if the latter, what course it pursued, all of the answers calling attention to the viscera implicated in the disturbance.

Explicit inquiry should be made into all facts surrounding the first discovery of the tumor, having the patient locate as nearly as possible where it was first felt and what circumstance led to its discovery; what is the patient's estimate of its comparative character, size, position and density; is it movable or not? Has the patient jaundice, indicating trouble with the liver or gall-bladder? Ascertain whether or not hæmaturia is present, whether pus is found in the urine, indicating kidney growth or disease. Is there any interference with menstruation? And so on, I might refer in succession to all the functions of the body, gleaning from some or many of them, points of information bearing directly on the character of the growth under consideration. Especially is it important to ascertain the effects of change of position of the patient's body on that of the tumor, incidental to, and accompanying the growth and its increase in size; such facts many times fixing definitely the situation of the tumor as to its relation with the diaphragm, its relation with important blood vessels, or the patency of the alimentary canal. In positively removable tumors it is of great importance to obtain full information as to whether there has been inflammation over the surface of the tumor or in its neighborhood, calling attention to the probable occurrence of a circumscribed peritonitis which may have left adhesions to interfere with or render grave, the removal of the tumor.

When a tumor, moderate in size, above the transverse line mentioned, is not affected by the movements of the diaphragm, its attachments are very firm or it is post-peritoneal—if movable it is most likely to be amenable to operation. On the other hand some of the post-peritoneal tumors, especially those connected with the kidneys, move with respiration.

The condition of the patient with reference to obesity, or large accumulations of fat over the surface of the abdomen will obscure the certainty of diagnosis to a considerable degree. Of course it is scarcely necessary for me to mention the fact that fatty accumulations on the abdomen have been mistaken for abdominal tumors, and that the mistake was undiscovered until the incision disclosed its nature. The fact whether the abdominal walls have been thinned out or distended with previous growths or accumulation within them will modify very materially the results of the application of these rules. Cases of great distention of the abdominal walls, and of tumors large in themselves are difficult problems in diagnosis. It must be remembered that here as well as in all that we have to do, the old illustration of the bundle of twigs is applicable; one twig is powerless, useless, but altogether, firmly bound and interlaced, are strong to support and encourage. A very safe way, and perhaps frequently the only way of arriving at a conclusion as to what any given tumor may be, is to prove conclusively to one's mind what it cannot be by exclusion.

INSPECTION.

What can be learned by inspection? One accustomed to the irregularities of the normal abdomen will notice any deviation in its surface at a glance. Here, just as in consideration of injuries of the extremities, it is always well to compare the two sides, thus eliciting the probable nature of that which distends the abdominal walls. Frequently irregularities of the surface of the growth can be noted. The eye can tell whether the growth moves during the act of respiration and in that way show whether it has any connection with the movements of the diaphragm; or, if the patient is moved from one position to another, it notices whether the growth changes its position correspondingly. It tells whether the growth is above or below the umbilicus, whether to the right or the left of the mid line, whether the distension is mainly above the transverse line, as shown by increase of the distance between the sternum and the umbilicus, or below the transverse line, by increase of distance between the pubes and umbilicus,—facts suggesting the organ from which the tumor grows. The eye can detect scars and unhealthy conditions of the skin so often accompanying ascites, or the presence of varicose veins. The latter found below the umbilicus indicate pressure and interference with the return circulation through the Illiac Vein or Vena Cava, showing a complication to be met with during the operation, or indicating a post peritoneal growth.

PALPATION.

Palpation may be practised with the fingers alone, with one hand or with both hands. It is, in my experience, not of much consequence whether the fingers be used singly, or whether the hand be used edgewise or through its palmer surface or whether both hands be used, so that the pressure is evenly distributed, and especially lightly applied. Avoid stimulation of muscular contraction of the abdominal walls by harsh manipulations of any kind. It is well, during palpation to divert the patient's mind from the examination. Much information is very often obtained by the mere touch of the hand or finger tips; many times nothing, however skillfully the hand may be used. By palpation one can estimate the thickness of the abdominal walls; can determine the presence of œdema, and can tell whether the walls are movable over the surface of the tumor. Steady and constant pressure with one or both hands on the abdomen during expiration, may press the anterior against the posterior abdominal walls, determining the absence of any tumor whatever, or proving the mobility of any growth by its complete displacement. With regard to the tumor itself, facts may be elicited as to the smoothness, or the irregularities of its surface; if regular, as to its form and structure; if irregular, whether it is nodulated or not, whether these nodules are movable on the main mass; or in both instances whether the mass is movable only as a whole, and to what extent. If the tumor is movable, are any of the adjacent organs carried with it during the movements? What is its degree of density, whether solid, or elastic; does it contain fluid? Does irritation with the finger tips stimulate contractions in the mass so that it is felt to harden under the fingers? a condition found only in the walls of a pregnant uterus, so far as I know. By palpation we learn whether the tumor pulsates or not, or has connected with it a heaving motion synchronous with the pulse. Occasionally there can be elicited over the surface of the tumor, by carrying one finger after another within circumscribed areas, a crackling sensation which, in my experience, always indicates the presence of the bowel between the abdominal wall and the tumor, and is evidence in favor of the growth being post peritoneal.

When palpation with the whole hand fails, palpation with the finger tips may elicit the desired information. I have been satisfied of the existence of a partially distended gall-bladder by finger tip examination, when examination by the entire hand failed to discover anything. In the same way tender spots can be detected; or the peculiar hardness and resistance of the abdominal walls in circumscribed areas caused by the fixation accompanying inflammations of the peritoneum or of special organs contained therein.

PERCUSSION.

Percussion should be practiced with a light hand if it is desired to elicit the presence of resonance between the tumor and the abdominal walls, or of the intestines around the surface of the tumor, or of gaseous distension of the tumor itself when it has become enlarged to such an extent as to displace the intestines or to map out accurately the boundaries and relations of any growth. Percussion with a free hand is necesssary to elicit resonance of the deeply seated organs or through thick abdominal walls.

Percussion determines the diagnosis between a circumscribed abdominal growth and free fluid in the abdominal cavity. A change in the position of resonance following corresponding change in the position of the patient, shows either a mobility of the tumor, or a displacement of free fluid to the lowest point of the cavity.

Resonance in the flank with the abdomen fully distended with a tumor argues in favor of a growth springing from below the umbilicus. If flatness is present it argues in favor of growths springing from above, and these latter are usually post-peritoneal in character. A circumscribed strip of resonance found over a tumor in either lateral region of the abdomen indicates the presence of the colon over the growth. Circumscribed resonance elsewhere indicates the presence of a loop of small intestine between the tumor and the abdominal wall, and in case the circumscribed resonance persists there is usually an adhesion between the fold of intestine and the growth.

AUSCULTATION.

The use of the ear or the stethoscope will detect through the abdominal wall, pulsations and their character, whether synchronous with the pulsations of the heart. The presence of large arterial trunks in the walls of the tumor may be determined, also the probable attachment of the growth to large vessels. The pulsations of the foetal heart and the placental souffle may be heard.

FLUCTUATION.

Fluctuation is a sensation communicated to the fingers by the waves of the fluid contained within the walls of the tumor or in the peritoneal cavity. These waves are produced by blows striking any point of the surface of the abdomen, the impulse being transmitted through this contained fluid to the hand resting in contact with some opposing point. Inquiry should be made as to whether this impulse is free and easily obtained, whether the thrill is communicated almost as quickly as the application of the force which produced it. If so, this indicates great accumulation of free abdominal fluid, or fluid contained in a very thin walled cyst. The presence of fluctuation does not always indicate the presence of a tumor, neither does its absence by any means prove that a tumor does not exist containing a large amount of fluid. Thick cyst walls, for instance, will frequently prevent the surgeon from eliciting its presence. Large quantities of free fluid frequently conceal an abdominal growth entirely.

A tumor growing below the transverse line, not accompanied with inflammatory symptoms, in which fluctuation can be obtained, no matter what position the patient assumes, is an ovarian tumor. The exception to this being probably circumscribed ascites.

ADHESIONS.

In spite of the many times that the abdominal cavity has been incised and examined for the purpose of removing tumors, and by the most experienced men, it is not possible for us to determine, accurately, the presence or absence of adhesions previous to the opening of the abdomen. We can infer as to their existence or non-existence from the history of the case, whether there has been inflammation in those parts to have formed adhesions, but it will only be an inference. It has come to me as an outgrowth of experience to believe that the general appearance of the patient is somewhat of an indication as to the probability of their presence or absence. With the tumor growing to a considerable size, especially an ovarian tumor, without making any marked change in the general health of the individual, especially in the countenance or features, the tumor will usually prove to be a single cyst with thick walls without adhesions. On the other hand, if there is a marked change in the general health and facial expression, one can expect to find a multilocular cyst with thin walls and adhesions. In many of these cases the contents of the multilocular cyst are deleterious to the system, and there is an effort on the part of nature by the formation of adhesions, to prevent rupture of the cyst wall, in this way avoiding the escape of the fluid which menaces the life of the patient. The proximity of this dangerous fluid determines the rapid formation of adhesions here, just as we see them occur in pelvic abscesses and other pus formations. In case the vitality of the tumor itself is threatened by a twist in its pedicle, by which its source of nourishment is diminished, there will immediately arise adhesions about the tumor through which its vitality can be maintained and its nourishment furnished.

Sometimes the life of a tumor and its further growth is provided for in this way after complete separation of its pedicle, a subsequent operation showing entire absence of a pedicle.

Complications.

Under this head comes suppuration accompanied with severe constitutional symptoms indicating its presence. Occasionally sub-normal temperature during the day with almost surely, a regular increase or a high temperature at night points to this condition.

There is one complication in connection with ovarian tumors in which an operation must be done immediately in order to save the patient's life. I refer to a twisted pedicle caused by a rotation of the tumor on its axis; the explanations of this rotation are not very plain. Some attribute it to unusual movement of the body, others to the influence of a distended colon or sigmoid flexure. The twists give rise to severe trouble if they are sufficient to interfere to any great extent with the circulation of the pedicle, which is manifested by a rise of temperature, increased pulse, pain coming on suddenly, sometimes local peritonitis and bloody discharges from the vagina. These signs appearing with a previous history of the tumor indicate the occurrence of a twisted pedicle and require immediate operation.

Tapping.

So much may be learned and so little harm results, under proper conditions from a slight opening in the abdominal walls (which can be enlarged to the necessary size for the removal of a tumor), that Tapping in its ordinary sense is not resorted to often nowadays. Furthermore, surgeons have learned that it is very far from being a harmless procedure. The dangers attending the practice, even with the Hypodermic Syringe, are from within and from without. The danger from without comes from the possibility of the introduction into the cyst or the peritoneal cavity of septic material. This can be avoided by obeying the rule never to practice tapping without being protected by thorough antiseptic preparation and care, just as faithfully carried out as if the open operation is to be done. Special danger arises in cysts with special contents, such as pus, hydatids, etc. The danger from within comes from the liability of the contents of the tumor contaminating the system with its frequently poisonous material. With a greatly distended cyst-wall the likelihood of extravasation is co-existent with its perforation, with even a very small needle. No inference of the character of the contents can be made from external examination; hence the bad cases cannot be avoided by a selection of cases. If resorted to, the greatest safety follows complete emptying of the contents so that the shriveling of the cyst may close the opening. Few operators spend any time in hunting for Drysdale's cell—once supposed to be a sure diagnostic evidence of ovarian growth.

Vaginal Examination.

Vaginal examination should always be practiced, at least in all tumors filling the abdomen as low as the pubes. By its means we are able to determine the condition of the uterus, its connection with the tumor, or the probability of the existence of pregnancy. Also the position, condition and degree of distension of the bladder. It is scarcely to be supposed that nowadays preparations should be made for an operation for an abdominal tumor, when at the last moment the catheter would prove it to be only a distended bladder.

The Bladder.

The bladder is very apt to be carried away from its normal position by all solid growths developing from the pelvis, and in this abnormal position it lies frequently in the line of incision made for exposing abdominal tumors. There is little difference whether the viscus be full or empty. Some claim, however, that a partially distended bladder is of advantage in making it more easily recognized after the incision is made. An exudation in the line of incision into the abdominal walls from any cause, as well as unusual bleeding when the peritoneum is reached, warns the operator to make the opening through the peritoneum at the highest point of the incision. In all lateral incisions through the abdominal walls greater care must be used in recognizing the peritoneum than when the incision is made in the linea alba because of the non-existence of loose tissue outside of the peritoneum. Also more care must be used to prevent entrance of blood into the peritoneal cavity. As a rule the greater number of abdominal tumors will be removed by an incision through the mid line. Special tumors, such as those of the gall bladder, sigmoid flexure, some diseases of the kidneys and of the pancreas are best removed through an incision over the most prominent part of the tumor. For instance a straight incision downward over the distended gall-bladder from the tip of the tenth rib. In my experience, the lateral incision has done quite as well and there has been no more tendency towards ventral hernia than when the incision was made in the mid line.

RECTAL EXAMINATION.

Very often the character and relation of many abdominal tumors may be ascertained by an examination through the rectum, especially if they are pelvic in origin.

ANÆSTHESIA.

The abolishing of muscular rigidity is of great usefulness in many doubtful cases. With me, ether is oftenest used, still chloroform is certainly better if any degeneration of the kidneys or much bronchial irritation be present.

GENERAL CONDITION.

The influence of the growth on the vital organs, as the heart, kidneys and alimentary tract should always be a source of special inquiry on the part of the surgeon. Old age and infancy should apparently militate against operation. Still, at least in ovarian tumors, the proportion of recoveries in cases of this nature seem to be equally as good as in middle life. I have had a recovery at seven years of age and one at eighty-one from ovarian tumors.

TIME.

All things considered, the best time at which to remove an ovarian tumor is as soon as possible after its discovery. The old theory is exploded that the results are better after the operation if the surgeon waits until the system seems to become accustomed to the tumor during its development. The sooner the operation is done after the discovery of the tumor the sooner will be the recovery.

TECHNIQUE OF ABDOMINAL OPERATIONS.

Gentlemen: The subject of my remarks to-night is the Technique of Abdominal Operations. This involves a question of great importance, and one that is extensive in its range as well. As I understand the word "technique" it refers to the little things which the surgeon learns from time to time from various operations, and which impress him as being of vast importance from the fact they help greatly towards successful results as well as to the more important and generally known steps in the different operations. The details, perhaps minor and seemingly of little value, are of great worth; they are the little things with which we must become so familiar that there is no necessity for one to think of them; one must be so thoroughly imbued with their usefulness that they are executed apparently without thought (because all of these details to which your attention will be directed cannot be, in their minutæ, thought of each time; yet with added experience in these cases every one of them will be practiced in every operation.)

It will be appropriate to first speak of what might be called the medical treatment of all cases of abdominal trouble in which surgical treatment must be adopted, and this will require a brief reference to the necessity of ascertaining the condition of the patient's heart, kidneys, lungs and skin. The patient is entitled to an examination which will enable the surgeon to understand the general condition of the system, its vital resources and its powers of resistance to any injury which may be inflicted. It is not very satisfactory to have the experience of finding grave complications arise subsequent to an operation, which might have been avoided, at least temporarily, by proper care and attention to the condition of these organs. It helps also in the diagnosis. Very frequently a careful examination of the secretions of the kidneys will explain a condition which may not have any relation to the disease for which a surgical operation is to be done. A judicious use of the milder diuretics, such as free administration of water and carbonate of lithia or other diuretics, will unload these emunctories and refit them for the performance of their normal function to an adequate degree.

Again, examination of the heart will perhaps enable one to give it a little increased ability to meet the strain that comes on subsequently, requiring strength and regularity in its beat. The administration for a day or two of the tincture of digitalis and iron may enable the heart to withstand an additional strain. Certainly the examination will enable the surgeon to advise against a formidable operation which would overtask its strength or express that gravity of prognosis in the case which its diseased condition suggests. The presence of valvular disease of the heart does not necessarily militate against operation in the abdominal cavity. This has been demonstrated in operations that were formidable, which called upon the patient for great resources and recuperative vitality, which have been successfully performed and with recovery of the patient, notwithstanding the fact that there was present aortic obstruction or mitral deficiency.

An illustrative example occurred in my practice within the last three or four weeks: this was the case of a young girl thirteen years of age, suffering with severe valvular heart disease of many years duration. She was debilitated in every way, with a pulse of 130, with a heart so much dilated and so rapid and forcible in its beat that its commotion could be seen across the room. This patient was subjected to amputation of the hip joint and passed on to recovery without any complication.

There are cases on record in which large abdominal tumors have been removed successfully while tuberculosis of the lungs was present, the patient complaining more of the distress of the tumor than of the lung trouble.

The condition of the skin should be attended to; we depend upon it for elimination, which passes the patient on to recovery in many instances. Moreover, every patient should be prepared in every way so that the body may be in the most favorable condition to resist any trouble that may come upon it.

My experience convinces me that much can be done before the operation to prevent the patient being seriously shocked by the operative procedure. My attention has lately been attracted to the published remarks of such authority as Prof. Stephen Smith of New York, who says that he has recently formed the habit of freely stimulating his patients with alcoholic stimulants before any operation, in order to avoid shock; he gives repeated doses of whiskey before the operation so that the patient is practically semi-intoxicated at the time of the operation. I cannot go quite so far as that for if shock is escaped, there may be the subsequent depressing effects of large doses of alcohol, but I do believe that much may be accomplished by giving ten grains of quinine an hour before the operation.

Now a few words about the previous preparation of the patient for any abdominal operation, whatever its nature.

It has become a rule with me to advise all patients coming for operation, to submit themselves to preparatory treatment for three days previous to the day of the operation, and these three days are devoted among other things to clearing out the alimentary tract, not only for the purpose of getting rid of material that has been lodged in the intestines from pressure of the growth or as the result of constipation, but to disinfect it, and also to have the intestines in such a condition that they will not prove a source of trouble during the operation, from gaseous distension. There is no more troublesome complication during the performance of an operation in the abdomen than full intestines coming in contact with one's fingers. This can be entirely avoided by proper preparations.

First, the patient should have only liquid diet, full of nutrition but containing very little foreign material, nothing that will lead to accumulations in the intestines. Milk, beef tea, soup and broths of many kinds may be given at intervals of three hours. The patient will certainly subsist for that length of time without any trouble on this diet.

Second, cathartics should be given freely during these three days whether the patient is constipated or not; the best and most reliable one and the one which will give the least discomfort to the patient, is castor oil, and this should be assisted thoroughly with enemata. It is needless to hint to you perhaps that these preparations will sometimes get rid of the tumor. There comes to mind now an instance, in which a very good surgeon, a man whose opinion is equal to that of any one, had the misfortune to cut down on a tumor in the abdominal cavity and to find that it was nothing but a fæcal accumulation. By pursuing the course indicated this possible complication in abdominal diagnosis will be avoided.

The abdomen should be thoroughly shaved, and this preparation should not be deferred until the day of the operation; it should be done the first day, so that whatever other dressings are made use of shall have an opportunity to come in contact with the skin and not be kept away from it by the presence of hair. If the patient is a female, she should have during this time repeated vaginal douches, and these should be bichloride of mercury in the proportion of 1-5000. Always after giving a douche of this kind, follow it by a douche of sterilized water so as not to leave any of the solution in the vagina.

Upon the day previous to the operation after the douche, the vagina should be packed with iodoform gauze. This care of the vagina is most necessary, because repeatedly during operations upon the abdominal cavity, some complication arises which necessitates an examination of the vagina and if it has not been specially prepared, the operation may endanger the patient's life.

The patient should always be given a general bath. It cleanses the entire surface of the body and softens the skin and thus facilitates elimination. Of course the seat of the operation should be subjected to repeated washings with soap and water—not only washing but real scrubbing with a brush so that every portion of it, every depression shall be thoroughly cleansed. It should also be washed with a solution of bichloride of mercury 1 in 5000, and then washed with alcohol or ether to dissolve out the fats and any harmful substances that have not been reached by the previous washing.

The night before the operation, there should be applied to the surface which is to be the seat of the operation, a compress moistened in a 2 1-2 per cent. solution of carbolic acid. A stronger solution will very frequently cause vesication of the skin. The object is to soak into the skin the germicide material in order to disinfect such places as have not been reached by the applications previously made to the abdomen. Special care should be taken with reference to cleaning the umbilicus and the more marked creases or folds of the groin and such places. After a patient comes under your charge and has had a general bath, she should not be allowed to use any clothing that has been previously worn.

Let us take a few moments in the consideration of the instruments that are to be used. First, the number of the instruments: many troublesome conditions may arise during the performance of an operation in the abdomen for different diseases, from the fact that the surgeon does not have the proper instruments or a sufficient number and variety. For my own personal advantage, I have a set of instruments that I always have with me in all abdominal operations and these instruments are never used for any other purpose. It is true that with the ordinary hæmostatic forceps and a scalpel, a surgeon may do an ordinary laparotomy, but there are cases often met with in which one requires a number of different instruments, they all have their use; have them where they can be gotten at.

They are carried in a canvas case like this, which can be washed; they are always clean and easily kept in perfect order.

In regard to the preparation of the instruments:—they should always be scrubbed well with soap and water, then with hot water, giving special attention to the serrations which cannot be polished, the jaws, angles and joints of the instrument; and finally, after these washings, boiling hot water should be poured over them.

If the case happens to have pus about it, the instruments can be cleaned perfectly by boiling them for twenty minutes in water to which bicarbonate of sodium has been added in the proportion of tablespoonful for the quart. Of course there are other methods of preparing the instruments than boiling in water, but this is the easiest and best way because the other means are not always at hand. After this preparation and just before rinsing them, it is well to wipe them thoroughly with alcohol.

Next for consideration are the sutures, ligatures and sponges. It is becoming a habit with me to use nothing but silk in the abdominal cavity. It is made perfectly safe and reliable in a very simple way—by boiling half an hour in a 5 per cent. solution of carbolic acid; or perhaps even a simpler way, is to boil it for one-half hour in water, then to preserve it, in 5 per cent. carbolic acid. Catgut and other ligatures should be prepared by scrubbing them thoroughly by repeatedly drawing them through a wet towel, then permitting them to dry and immersing them in sulphuric ether for 24 hours and then immersing them in a 1 to 1,000 solution of bichloride of mercury, in alcohol for one week, afterwards to be kept in pure alcohol or oil of juniper. Either of these ways will make catgut perfectly aseptic.

The silk is perfectly reliable, easily prepared, and it never breaks if of the right size, and it is more easily handled than other material; the silk ligatures have never given me any trouble; in cases where not infected before the operation it is encysted rapidly in the peritoneal cavity and does no harm.

There is another material which is frequently used about operations in the abdomen and that is the silk-worm gut. It is an elegant material, easily cleansed, easily prepared and non-irritating in every way.

Now with reference to the sponges: outside of the abdomen use sterilized gauze. The ordinary cheese cloth gauze sterilized and caught up in bunches and just previous to the operation dipped in a 2 1-2 per cent. solution of carbolic acid, squeezed thoroughly dry, can be used for the purpose of cleaning on the outside. In the peritoneal cavity the sea sponge is best, is more easily prepared and best answers every purpose.

Radical, positive rules with regard to sponges are the best to follow; an operator should be accustomed to having always the same number of sponges. The size of half one's fist is plenty large enough for the common sponge; it can be placed on a holder or used as a free sponge. Two of the sponges should be large and flat, as large as a dinner plate and very thin; they are used for the purpose of keeping the intestines out of the way and for general protection. By means of two of these sponges the peritoneal cavity can be absolutely isolated so far as the intestines are concerned, from the field of operation, and they are not only kept out of the operator's way but are also kept from exposure to the air. Frequently when large openings are made in the abdominal cavity prolapse of the intestines becomes a real source of danger. Besides these sponges, squares of iodoform gauze can be used for the same purpose and always with the same care in counting.

The hands of the surgeon and his assistant should be scrubbed thoroughly in soap and water for five minutes, the finger nails should be cleaned and a good deal of attention paid to them, then the hands should be washed in alcohol, previous to the operation. During the operation they should be repeatedly washed in sterilized water. In pus cases the hands should be scrubbed even during the operation and washed in bichloride of mercury solution.

There has been much discussion as to whether the bladder should be emptied or allowed to remain full. It makes but little difference. In cases in which you expect to find the bladder drawn up behind the pubis and in the way, some operators insist that the fluid should remain. Cases in which it retains its normal position in the pelvis, it is best emptied, and this should be done before the patient goes into the operating room. In my own practice I always have the bladder emptied immediately before the patient is brought to the operating room.

When the patient is uncovered ready for the incision, the surface should be washed again with alcohol or ether and then with sterilized water. After covering the patient with blankets around the feet and shoulders, these blankets should be covered with dry towels both above and below the line of incision and these subsequently covered with towels wet in a three per cent. solution of carbolic acid and water.

The instruments used should be kept in a warm 2 per cent solution of carbolic acid.

Allow me to say a few words with reference to the rules which should be carried out implicitly during the operation:

First.—The sponges must be counted before the operation and also before the abdomen is closed; never omit this direction under any circumstances.

Second.—Allow no sponge to be torn, no matter what the necessity for small pieces may be, nor allow them to be touched by any person but the operator, his assistant and the nurse. A visitor thinks he can assist a little by pushing a sponge in the way of the assistant—if touched it is contaminated, and may be the cause of fatal peritonitis.

Third.—At least two basins containing sterilized water are necessary for cleansing the sponges; one for cleansing the blood out of them and the fresh one for a thorough rinsing.

Fourth.—If it be a pus case, the sponges must be thrown away as soon as soiled, and never used a second time during the same operation.

Fifth.—The area of the operation must not be touched by any one but the operator and his assistant.

Sixth.—No one but the operator should introduce anything into the peritoneal cavity. This is a very important rule, about which you must be constantly on your guard and insist on its observance. Your assistant, a friend perhaps, may know as much as you do about the operation, or more, and it is natural for him to thoughtlessly help too much. It is impossible to keep track of what your assistant does, if he acts independently, your mind being occupied with other responsibilities of the operation. More than once, when I have counted the sponges after the operation, one was missing and was finally found in the abdominal cavity, left there by the assistant.

Seventh.—It should be a rule that the operator, the assistants, and every one going near the patient should have their clothes entirely covered with a sterilized gown.

Eighth.—Any instruments or appliances dropped on the floor must not be used again until they are thoroughly cleansed.

Ninth.—No unclean object should be touched by any one concerned in the operation.

Tenth.—Needles and sutures must not be touched by any one except the operator and his first assistant.

Eleventh.—Towels must be changed as soon as soiled.

Twelfth.—The anæsthetizer must not be considered an assistant, he must attend to his business alone.

The reason for these rules is the prevention of contact infection of patients; in other words, to limit the amount of danger of infection from surrounding objects.

All that has been said with reference to the preparation of the patient, the operator and his assistants, has one object in view; to impress strongly my belief that the success of abdominal operations, in fact all operations in surgery, the avoidance of inflammation, the prevention of death and the probability of leading the greatest number of cases to recovery, depends mainly upon one's belief in infection and the necessity of avoiding it by scrupulously carrying out the minute details of these instructions.

We all know that the records of death following operations on the abdomen have been greatly lessened since the days of antiseptic surgery, and this depends entirely upon the surgeon believing positively and religiously that he has infected his patient whenever inflammation has occurred. I do not say that he can always avoid it; I am quite convinced that he cannot; no matter how much care he may take the patient will in one way or another become infected occasionally, but by employing all means, there will be very few fatal cases.

After the patient is prepared and fully protected from any danger that may arise from opening the cellular spaces of the body, the question comes up whether there shall be a long or short incision. Those who have not had much experience do the work better with a long incision, while those who have had a great deal of experience get along with a short one. The length of the incision is not a source of danger to the patient provided your operation is done aseptically, except that with a long incision there is more chance of infection, and also of one of the unfortunate sequalæ of abdominal operations, namely, ventral hernia. So it is preferable to make the incision only just as long as is necessary to accomplish the purpose of the operation. The first incision is made with a free hand, a free cut of the knife; for there is no surgeon who fails to know that wounds in any part of the body which are not made freely, are less likely to unite promptly; they are uneven and do not come together nicely, so the incision should be made with a free hand and in most cases, in the mid line, because there are fewer cellular spaces and lymph spaces to be opened here than in other parts of the abdomen, and the danger of infection is diminished by just so much. Then the two walls of the cut remain even in the mid line while in other parts they are uneven.

When making an incision in the abdomen for a large solid tumor remember always that in many tumors, the bladder is carried up beneath the line of the incision. It is rather interesting to look over the experiences of a number of operators, to find how many have opened the bladder by incision through the abdominal cavity. It is not a terrible accident to happen; the patients usually recover, but it is to be avoided, of course.

In making the incision as you cut down through the tissues and reach the peritoneum, open into the peritoneal cavity at the highest point of the incision. Always watch the tissues as they come under inspection as the knife divides them, and if the vascularity increases rather than diminishes, it is an intimation to you that next the peritoneum there is present either the bladder or some condition of inflammation; a freely bleeding peritoneum always indicates this. It is well to remember this point in connection with the incision.

To control the hemorrhage from the incision through the abdominal wall I seldom apply a ligature, but secure the open vessels with forceps and the hemorrhage will be stopped permanently before the operation is over. I prefer the Spencer Wells forceps for this purpose; they are very powerful in the handle, and with them you can exert a sufficient force.

In exposing the peritoneum I never use a director. As soon as the transversalis fascia is exposed and the bleeding controlled, the final opening through the peritoneum is made in the following manner: The assistant seizes the transversalis fascia and the peritoneum on one side while the operator seizes them on the other, and so lift them up without injuring anything that may be beneath. An incision is made through the peritoneum between the two forceps. The first step after opening the peritoneal cavity, is to control hemorrhage. That is, there should be ready all means adapted to the purpose of controlling any hemorrhage which may occur in further manipulations in case of removing a tumor. Of course this embraces ligatures, and the best ligature is the Japanese raw undyed silk; it is the strongest and best of all silks, and is absolutely reliable. A smaller size with this than with any other ligature can be used, and of course the smaller the ligature the better, because of its greater certainty of becomencapsulated.

Sponges should be ready for the purpose of making sponge pressure, and gauze of some kind or other, iodoform gauze is best, should always be at hand for the same purpose.

Very frequently in opening the abdominal cavity and removing tumors, large surfaces, left by the detachment of adhesions, ooze freely, filling the abdomen with blood and endangering the success of the operation. This can be prevented by the use of two or three pieces of gauze, or several sponges, pushing them into the cavity and letting them stay there during the continuance of the operation.

The hypodermic syringe is sometimes employed for the purpose of ascertaining the contents of the tumor. There is great danger from it; one never knows the exact condition of the contents of a tumor—whether they are infectious or not. But the aspirator, and the trocar as well, may be used before the operation, with safety to the patient, to afford temporary relief in case one is absolutely positive that no septic material is contained in the tumor.

After the incision is made and the growth exposed, comes the question how to manage the tumor. In cystic tumors my rule is to empty the tumor before doing anything else, by means of a trocar of good size. Empty it thoroughly so as to prevent any danger from its contents leaking about. There is a way to empty a cyst and a way not to do it. When the trocar is about to be introduced into the walls of the cyst for the purpose of emptying it, the assistant should make pressure above the mass, shutting off the peritoneal cavity by keeping the cyst wall in close contact with the incision, so if there is any trouble with the trocar after puncture, no dribblings of the contents will get into the peritoneal cavity. No attempt should be made to pick the sack up until it is wrinkled. The following accident has happened more than once: As soon the trocar is introduced into the cyst, the surgeon attempts to grasp the sac with forceps to pull it out of the incision. If he attempts this while the sac is distended, before the sac walls are flabby, the probability is he will shove the sac off the trocar and loose the opening in it and have a flood of the contents over everything. Wait until the sac is emptied sufficiently to wrinkle and then it can be easily secured with forceps. Cases occur in which the contents will not flow through a trocar. Under these circumstances a free incision should be made into the exposed portion of the sac and then the sac wall is seized with forceps and united with the integument or held in contact with the wound while the contents are emptied. As soon as emptied, by pressure from behind and by pulling through the wound, the cyst is brought out of the cavity, at the same time bringing into view the adhesions.

Here is a very large solid tumor, which was removed a few weeks ago, weighing 42 pounds. It was universally adherent and the adhesions present were examples of all the various kinds, long and slender, short and thick, non-vascular and very vascular. Any tumor may be attached universally to the abdominal walls throughout its entire surface. It may have the intestines attached to it, it may have the bladder bound to it, or the uterus, or any of the organs in the abdominal cavity.

There are well known rules for the management of the adhesions. The danger from adhesions is from their vascularity. No harm comes from peeling off adhesions from the surface of the tumor and dropping them into the peritoneal cavity unless they are very vascular.

One must always bear in mind the fact that bleeding in the peritoneal cavity is very severe from small vessels, and all vessels that give rise to bleeding in any way whatever, should be controlled by the use of ligatures.

When the adhesions are to the intestinal tract, usually they are very sessile, that is the attachment is close and broad. Many of these adhesions are soft in character and can be removed merely by the touch of the finger, or can be sponged off, as you would dirt from any surface.

Here is an illustration of what I call long and slender adhesions. They are non-vascular and the manner of removal is to slip the finger beneath them and slide it over the tumor for some distance, when they are easily detached. The free ends are allowed to drop into the peritoneal cavity, after a ligature has been applied to control the bleeding. If quite long and large they should be perforated and tied in halves, divided and dropped. If very vascular they should be tied in two places and then divided between the ligatures, so as to prevent bleeding from either end into the peritoneal cavity.

The bleeding surfaces left after separating adhesions from the uterine surface or the surface of the bladder, are managed in this way: You know the bladder and uterus are very vascular organs, and adhesions in these cases are apt to be so close and intimate with the tumor, that there is nothing to be tied. With your fingers you can separate the tumor from the uterus or bladder and you have a surface probably three or four inches in extent, bleeding from all points, and vessels that you can pick up. On one occasion I inverted the surface of a bladder that was bleeding, picked up the edges of the cavity thus formed and surrounded them with a ligature, drawn just tight enough to hold the walls together, but not tight enough to shut off nutrition; it succeeded perfectly, no trouble with urination following.

A few days ago in removing a tumor adherent to the surface of the bladder, the bladder surface bled so freely that the cavity between the bladder and uterus filled up in a few moments; sponge pressure was futile. It was controlled by threading a needle with catgut and sewing it in this way: introducing the needle at different points over the bleeding surfaces, it was folded in upon itself and securely fastened and the bleeding suppressed; of course great care was taken not to enter the cavity of the bladder. The same thing may be done with the surface of the uterus. By one means or another, the use of the ligature, the use of sponge pressure or in some of the ways indicated, the bleeding can be controlled.

When the pedicle is reached how should it be managed? It depends upon whether it is broad or narrow, thick or slender, long or short, or whether there is any pedicle at all. In some tumors developing from the pelvis, no pedicle whatever can be found. The same is true in cases in which the pedicle has been destroyed by twisting.

It is a good rule to always perforate the pedicle and tie it in halves no matter how small it may be; the rule is good because usually it prevents the slipping of the ligature which is attached to the pedicle, prevents the tissue of the pedicle from being withdrawn through the ligature and the loss of the patient from hemorrhage. Many times the pedicle must be divided still further and tied in three or four subdivisions. Unless it is sub-divided, bleeding may occur after the ligature is applied simply because there is so much tissue in the ligature that the pressure is not powerful enough to close the blood vessels.

In the management of the pedicle another thing must be remembered, that is that the line of its division, during the separation of the tumor, should be sufficiently far away from the point of application of the ligature. If you have a short pedicle and pull up on the surface of the broad ligament in order that the pedicle may come freely into view, and introduce your needle for ligation, the moment you let go of the tissues they pull out of the ligature and severe hemorrhage is certain to follow. Always leave sufficient amount of tissue beyond the ligature to prevent slipping.

Many tumors in their development expand the broad ligament over them completely or partially, so that when the base is brought into view there is no isolated pedicle to be found. Such cases are managed by the method termed Enucleation. An opening is made through the investing broad ligament as low down as possible, and the wall of the sac or tumor exposed, the finger is introduced into this opening and while it is held in close contact to the wall of the tumor, the broad ligament is stripped from this wall by carrying the finger upwards to the highest point of attachment of the broad ligament to its surface, at which point it is detached from the tumor. The broad ligament is so thinned out and non-vascular at the point at which it is detached from the tumor, that there is very little bleeding. The free ends of the broad ligament are seized by forceps and held out of the way. This procedure is carried out over the entire surface of the tumor and the latter is usually quickly lifted out of its bed in the expanded broad ligament. The detached portions of the broad ligament can then be made into a pedicle and ligated in the usual way, shortened and dropped.

Another accident which may occur in the management of the pedicle, and one which should be carefully avoided, happens in the following manner: The ends of the ligature which have secured the pedicle, are left long and are used for the purpose of handling the stump of the pedicle. This is a reprehensible practice; it has not infrequently happened that the ligature has been pulled off the pedicle leading to the occurrence of severe bleeding and great difficulty in re-securing the pedicle. The ends of the pedicle ligature should be cut short as soon as tied. If it is necessary to have control of the stump of the pedicle after ligation for any purpose, this is best done by clasping its tissues outside of the ligature with a pair of forceps.

The management of the intestines, in every case of abdominal section, is a very important item of consideration; they should be kept entirely from the field of operative manipulations in the cavity. This can be done by skillful use of the large flat sponges, to which reference has already been made. This can be still further facilitated by elevating the foot of the table and thus employing gravitation as a means of keeping the intestines out of the pelvis. Some operators are so thoroughly impressed with the imperative necessity of carrying out this instruction, that they always make a long incision and turn the intestines out of the cavity and lay them on the walls of the abdomen, where they are held by the assistant and protected by warm antiseptic towels. This procedure leaves the field of operation entirely free and untrammeled. In cases in which pus is likely to be discharged into the cavity, the utmost care must be taken to prevent it from mingling with the intestines and to provide a perfect evacuation of it.

THE TOILET OF THE PERITONEUM.

In many cases no sponging or other interference with the cavity is necessary after the removal of the tumor, because the surgeon, by the adoption of the means already suggested, has prevented anything from entering it. It should be cleansed of all debris, of blood clots, contents of the tumor, or any other substance which has accidentally fallen into it. Still, too much meddling with the intestines or surface of the parietal peritoneum, to get rid of small quantities of non-infectious material, is not necessary and is reprehensible. The peritoneum is able to safely take care of the small amount of bloody serum which may cover the intestines or other organs after almost any operation. In fact, the successful issue of many bad cases demonstrates its ability to care for remarkably large effusions of bloody serum, left in the cavity of the peritoneum or formed therein after an operation, provided it remain aseptic.

If the case has been accompanied with a good deal of bleeding into the peritoneal cavity, or especially if pus from any source has been discharged into it, then it is advisable to carefully cleanse it, and in a special manner. Large quantities of warm sterilized water should be thrown into the cavity by means of an irrigator, or poured into it from a pitcher. The overflow of water through the abdominal incision will carry out the offending material; the surplus of water should then be sponged out of the cavity. This is termed "flushing the abdomen." If there be much shock or depression, the patient is benefited by using the water very hot.

Many cases of ruptured pyo-salpynx with large discharge of pus have been treated by myself in this way, the patient showing very little or no reaction during the subsequent recovery. However beneficial "flushing" may be in some cases, it should be used with circumspection.

It is extremely essential that a careful review of the field of operation should be made in every case before the abdomen is closed, in order to secure permanently all bleeding surfaces, and to ascertain whether all the ligatures which have been applied are still secure.

DRAINAGE.

The use of the drainage tube, in my opinion, should always be avoided if possible; occasionally cases are met with after which its use is imperative. Such as those in which broad and extensive adhesions have been separated, leaving large oozing surfaces, or those in which pus sacs have been ruptured. The best drainage tube is made of glass, is moderate in size, no larger in caliber than a little finger, and having many minute perforations in the lower two inches of its length. It should be long enough to extend from the bottom of the cul-de-sac of Douglas to at least an inch outside the abdominal walls when closed. Its efficacy is increased and its purpose of drainage made more perfect by introducing down to the bottom of the tube a dampened wick of iodoform gauze. This gauze being left loose in the tube and long enough to extend some distance beyond the upper opening of the glass drain, by capillary attraction keeps the tube empty and carries the discharge well into the protective external dressing.

One objection to the drainage tube is that in preventing primary union of the wound it predisposes to ventral hernia; an additional danger in its use is the disposition of portions of the omentum, or even of the intestines, to be forced into the opening at its lower end and there become strangulated. This accident is in a measure avoided by changing the position of the tube at each dressing by rotating it on its long axis. It is entirely avoided by using a tube which is closed at the lower end with the exception of fine perforations, or in case an open tube is used, by having the iodoform gauze project slightly beyond the lower end. It has occasionally produced ulceration of the intestines by pressure, leading to the formation of fœcal fistula.

The ordinary rubber drainage tube has often for me fulfilled satisfactorily every purpose of the drain.

I have many times used with success the plan advised by Miculicz, of introducing into extensive cavities, a square of iodoform gauze, keeping the four edges outside the abdominal wound, and then packing the cavity of the gauze with ordinary sterilized gauze; thus at the same time making pressure and providing drainage. Or again I have used satisfactorily strips of gauze packed to the bottom of such a wound and brought out through the lower end of the external incision. It is always well, if the latter plan is adopted, to count the number of strips used, and to be sure that the same number of strips is withdrawn. A small portion of the gauze is withdrawn at each dressing until it is all removed, taking first those strips which are farthest from the intestines.

No harm has ever come in my experience from its use, and its efficacy has been plainly demonstrated.

CLOSURE OF THE WOUND.

It has always been my practice to use the interrupted silk suture for closing the external wound. The sutures are introduced at intervals of about three-fourths of an inch and include all the tissues of the abdominal walls, especial care being taken in approximating the transversalis fascia. Of late it has become the practice of a number of surgeons to close the abdominal wound by the use of the continuous catgut sutures, applied so as to bring in contact in succession the different layers of the abdominal walls; first, the peritoneal edges; second, the sheath of the rectus muscle; third, the deep and superficial fascia; and last, the integument. This procedure has not impressed me as being desirable or necessary; it cannot be as quickly done as by using the interrupted suture, and it is not followed by better results, if the operation and the material used are postively aseptic.

DRESSINGS.

On the external wound the dressings should be dry. The line of incision should be covered freely with iodoform or with powdered oxide of zinc, or painted with a 10 per cent. solution of iodoform in collodion. The iodoform quickly forms, with the blood and serum discharged from the wound, a dense crust, which is impervious, and which shuts the wound off from a possibility of external infection. It is my belief that a rather free dressing of iodoform gauze and borated cotton retained in position by a broad body bandage, is an additional protection against infection in the wound and a support to the abdominal walls, and by its even, elastic pressure, it equalizes the circulation in the abdominal cavity which has been disturbed by the sudden removal of a large tumor.

Some surgeons apply to the wound a small covering of iodoform gauze and borated cotton, held in position by a layer of collodion around the edges. Others use the small external dressing, and hold it in position and give support to the abdominal walls by broad strips of adhesive plaster carried across the abdomen.

If possible the bed in which the patient rests should be single, and means provided by a second bed or otherwise, for its perfect airing, and that it may be kept even, smooth and comfortable. When the patient is first put into the bed, it should be specially warmed, and means provided for retaining the body heat of the patient with bags or bottles of hot water. When first put to bed the patient should have her knees bent over a pillow, and her head and shoulders slightly elevated, in order to relax the abdominal walls, and so remove all tension from the wound.

In severe cases, however, with large loss of blood, or great shock, the patient must lie recumbent and the foot of the bed should be elevated.

As a rule, if the wound has pursued an aseptic course, the dressing will require no attention whatever, till the end of the first week, when the external dressing should be removed. The wound will be found, no matter what its extent, perfectly free from redness or tenderness, and thoroughly united.

The stitches can now be removed, care being taken not to draw the dried portion of the suture through its tract; this can be avoided by seizing the suture on one side or the other and exposing a buried portion, at which point it is divided and then withdrawn without pain or irritation.

If the wound has not passed an aseptic course, it is probable that the presence of stitch hole abscesses will be shown by a little hardness and tenderness and perhaps redness in the course of the sutures. When a patient, previously without trouble, displays a rise in temperature after the fifth day, the cause of such temperature will usually be found to depend upon the presence of these abscesses. Tney should be opened and rendered aseptic by the application of a large, moist three per cent. carbolic acid dressing.

AFTER-TREATMENT.

Usually no after-treatment is required if the preparation of the patient and the operation have been satisfactory. Constitutional-alcoholic stimulants are often of very decided advantage after an operation; they assist in elimination by strengthening a weak heart and helping the action of the kidneys and skin; they should not be given by the stomach for fear of increasing the vomiting. Apparently much benefit has resulted in my practice, from the use of an enema, consisting of a drachm or two of whiskey in a couple of tablespoonfuls of beef tea or warm milk, repeated at intervals of two or three hours. This supports the patient and overcomes faintness and depression.

FEEDING.

The diet for the first few days should be very mild. If the stomach is irritable, rectal alimentation must be depended upon.

An early evacuation of the bowels is desirable, and should be secured by stimulating peristalic action by the use of teaspoonful doses of Sulphate of Magnesium.

A rise of temperature to 102 degrees requires special treatment for its reduction; it is my belief that this is best accomplished by general sponging of the entire body with cold water. The use of powerful antipyretic drugs seems to me hazardous, and their use adds to the necessity for the elimination of an additional poison, to that already producing high temperature, hence an increasing labor upon the system.

Some surgeons advise strongly against the use of opiates in any form, believing that trouble in the intestinal tract, tympanitis and temporary obstruction of the bowel, follows as the direct result of their use. My opinion dissents from this assumption, for my belief is that the complications mentioned are always the result of infection; the opiate has nothing to do with it. If after the operation the patient experiences severe pain, from any cause whatever, the indications for its use are just as plain here as after any other operation. Used for the purpose of controlling pain alone, it will do no harm; the best results follow its administration per rectum—from thirty to sixty drops of the Deod. Tinct.

of opium in a little warm water. It is, however, better to secure an evacuation of the bowels or the passage of gas before using an opiate.

LOCAL TREATMENT.

Should adhesive straps be applied to the abdomen after the stitches are removed? If the abdominal walls are loose and flabby and hence no tension upon the wound, their use may be dispensed with; if there is any likelihood of unusual tension upon the wound they should be used; in any case they are a source of additional safety and comfort. In fact it is my belief that some support should be given to the abdominal walls by this means or the use of bandages, for a month or more after the operation, especially if the patient is to travel any distance after leaving the surgeon's care.

An accident from the lack of this precaution happened to a patient of mine. A very fat woman was operated upon for a large ovarian tumor. The case was normal and satisfactory in every way after the operation. Before the end of the third week she was compelled to go to her home in Nebraska; the wound seemed to be healed entirely. I received a letter from her doctor about a week after her departure, saying that the wound had opened from one end to the other through the skin and fat; while going from the depot to her home, five miles away, in a wagon, the severe jolting led to the occurrence of this accident. Strapping in that case would probably have avoided it.

A serious complication sometimes arises from infection of the deep portion of the wound, even after the complete healing of its superficial edges. This is the formation of abscesses between the peritoneum and the abdominal walls, in the line of the wound; this condition should be recognized early and receive prompt and vigorous treatment. Their presence is indicated by hardening of the tissues in the rectus muscle on each side of the wound, by tenderness to the touch, and by nightly rise of temperature. The use of the hypodermic needle, to locate early the formation of pus, is suggested. If pus is found, the abscess should be freely opened, emptied and made aseptic. Irritation of the wound from this source, or that of stitch-hole abscesses, is allayed by the use of wet dressings, consisting of sterilized gauze moistened with a two per cent. solution of carbolic acid, and covered by an impervious dressing.

Tympanitis, occurring after the operation, is a very serious and troublesome complication and its presence almost invariably implies septic infection; it is difficult to relieve by treatment. If free catharsis can be obtained, it usually passes away. The use of the rectal tube relieves distention of the large intestine, and should be practiced.

In extreme distention, with other efforts at relief failing, repeated puncture of the intestine through the abdominal walls, with a hypodermic needle, is recommended, and its practice has been followed by relief.

Prolonged anæsthesia, from any agent used, is occasionally followed by persistent and troublesome vomiting; if this complication follows the operation, the stomach should be kept entirely empty for 24 hours, or during its continuance. It is sometimes benefited by the use of ice pellets, or small quantities of very hot water, or hypodermic injections of morphia.

Of course, after a severe operation, the patient should be kept perfectly quiet in bed; this does not mean absolute confinement to one position. Many patients are so desirous of assisting in every way towards recovery, that they will move scarcely a finger, fearing harm as the result. The irksomeness and harmfulness of one position should be avoided, by allowing the patient to change her position from time to time, or instructing the nurse to make such change. There is no "little thing" which can result in more harm, than an over anxious nurse to be constantly instructing her patient "not to move" or "not to stir," for fear harm would result from the patient's attempt to comfort herself by change in her position.

There is no doubt in my mind that the patient should remain in bed for at least three weeks, to allow perfect union of the wound and safe repair in the pedicle; the larger the pedicle the greater the length of time that should be given for the healing process.

Ventral hernia would be less frequent in occurrence, if patients were kept in bed longer; besides, there are on record many cases which have passed through extreme danger from leaving the bed too early; even death has resulted from such haste. No doubt many cases of debility, pain in the pelvis, and other complications arise from such cause.

SPECIAL TUMORS—OVARIAN, PAR-OVARIAN, DERMOID.

Special management of these, or for that matter, any abdominal tumor, is greatly influenced by the size of the growth. In this specimen is shown a small, multiple cyst of the right ovary, not larger than one's fist, the removal of which was attended with far greater difficulty and anxiety, and required a much longer incision, than the removal of this very large ovarian cyst containing 30 pints of fluid. The smaller one was fixed in the pelvis directly behind the uterus, was hard and non-fluctuating, and possessing many of the characteristics of a fibroid growth of the uterus; in fact there was much doubt as to its character from pelvic examination. The pain which the patient suffered was intense, and I determined to operate for its removal.

The abominal section disclosed the pelvis filled with intestines, and they could not be gotten out of the way and the tumor removed, until the external incision had been prolonged to the umbilicus. The patient recovered. This larger tumor was uncovered by a three-inch incision, tapped, emptied and removed through this incision, no adhesion being present, and the intestines were not seen or touched during the operation. If there were a choice, my preference would be to attack large tumors, as being most easily managed.

Dermoid cysts are apt to present a great number of difficulties in their removal, because of their sessile attachments, thin walls easily ruptured, deleterious contents and extensive adhesions.

Adhesions should never be detached when they are out of sight, if it can possibly be avoided.

After emptying the cyst, all adhesions should be brought under the inspection of the eye and the control of the fingers, before being divided.

In my experience, the adhesions of an ovarian cyst, after it is emptied, can be safely managed in this way, no matter what may be their extent nor to what organ they may be attached. The length of the incision in the abdominal walls is of no consequence in comparison with the dangers attending the separation of adhesions through a short opening, without direct inspection and control. It is to be remembered, that in some cases the anterior surface of the ovarian cyst is so intimately adherent to the abdominal walls that no point of separation between them can be found. In such cases the sac should be emptied by a free incision through its anterior walls, and as the posterior wall of the cyst is usually free from adhesions, this can be seized with the fingers, introduced through the anterior opening, and turned inside out, in this way peeling the sac off from behind forwards, safely and readily.

Occasionally cases are met with so universally adherent in all directions, that the sac cannot be delivered; it should be thoroughly and completely emptied of all its contents, the edges of the opening in it sewed to the abdominal incision, the cavity packed with iodoform gauze and the usual dressings applied. As the sac contracts, quantities of the gauze packing are taken out from time to time until all is removed. In these cases the sac collapses, heals by contraction and granulation, and recovery ensues, although the repair may be prolonged for many months.

The contents of ovarian tumors vary greatly in consistency, color and other characteristics, depending upon the presence or absence of blood or pus.

The contents of par-ovarian cysts are usually clear and limpid and easily removed. In the majority of ovarian cysts, single or multilocular, the contents are sufficiently fluid to be emptied through a trocar. The different compartments of the multilocular variety, can usually be emptied through a single puncture of the trocar, by carrying it through the septa separating the different compartments through the cavity first emptied.

If this procedure does not reduce the size of the tumor sufficiently to allow of its being withdrawn through the abdominal opening, this result can be accomplished in the following manner: Withdraw the trocar and make the opening in the cyst large enough to admit the hand into this cavity to break down the septa and remove the contents, all the time keeping the walls of the cyst in contact with the abdominal incision, to prevent debris from falling into the cavity.

Ovarian cysts, with colloid contents, are many times difficult to manage, owing to the tenacity of the material filling them and the brittle condition of the cyst wall. If there are no adhesions, it is best to prolong the external incision and deliver the mass whole, as in cases of fibroid tumor, without attempting to empty it; if this cannot be done, they must be patiently removed piecemeal, great care being taken in cleaning the peritoneal cavity.

Cysts with colloid contents, and papillomatous cysts, are apt to be thin walled and prone to rupture, especially the latter, with dissemination of the included material and secretions into the peritoneal cavity.

The papillomata seldom reach great size, and early form adhesion to the walls of organs contained in the pelvis; they soon rupture and distend the abdomen with fluid, simulating closely, in their external manifestations, a case of ordinary ascites.

The absence of any discoverable disease of the kidneys, heart or liver, together with the absence of anasarca, local or general, with rapid reaccumulation of the fluid, if tapping is practiced, will arouse suspicion as to the nature of the trouble.

Careful examination of the pelvis, per vaginam, will determine the presence of the tumor, even if moderate in size. These tumors, owing to the existence of extensive adhesions many times present great difficulties in their removal, yet they can usually be turned out of their bed by enucleation. If the rupture has existed for some time they are peculiarly apt to infect the general peritoneum with papilloma, so that many times countless numbers of nodules of the disease are found scattered over the parietal peritoneum and the special organs of the abdomen and pelvis. When this condition is present, the patient is seldom, if ever permanently relieved by an operation.

Sometimes solid tumors of the ovary are met with possessing all the characteristics of fibromata, showing a well defined pedicle and presenting complications in their removal.

FIBROID TUMORS OR MYOMATA OF THE UTERUS.

There are five methods of dealing with these tumors recognized and practiced by surgeons.

First, removal of the ovaries and tubes.

Second, the intra-abdominal method of removing the uterus either with or without the formation of a stump.

Third, extra-abdominal method, with the stump fixed in the lower end of the external wound, or turned into the vagina.

Fourth, myomotomy, or enucleation of the tumor through the abdominal walls without opening the uterine cavity.

Fifth, the use of electricity.

There are certain general instructions which apply to the first three methods, and others which apply to the intra and extra-abdominal methods only, which are worthy of special consideration. In all three, particular attention must be directed to the control of hemorrhage, which will be very profuse primarily if the enlarged blood vessels are accidentally torn or opened, and certain to be fatal secondarily, if the means used for controlling the vessels after division, fail to remain absolutely secure during the recovery from the operation. As vessels are in a state of great tension at the time of ligation, the tissues included in the ligature are apt to retract and the ligature slip off; or by diminution in size of the vessel, the pressure of the ligature becomes insufficient, so that especially great care must be used in their application. Never approach the removal of a solid tumor of the uterus without having at hand every known means for the control, temporarily and permanently, of severe bleeding. If the extra or the intra-peritoneal method with a stump, is to be practiced, special apparatus should be in readiness for temporary or permanent application, such as Kœberle's serre-nœud, or the rubber elastic cord.

In all cases of removal of the uterus for myoma, the proximity of the ureters to the cervix, in their course to the bladder, and the probability of the bladder being drawn up on the anterior surface of the tumor, should be borne in mind; and injury to either of these organs be avoided.

In all cases in which the uterine cavity is opened, the especially noxious character of the secretions of its mucous membrane, should be remembered; the danger of infection from this cavity is particularly imminent, and is probably the reason why so many of these cases are fatal from septic peritonitis.

The instruments used in opening into this cavity should not be used again in the operation, before being specially cleaned; all other procedures in the operation should be stopped until this cavity has been rendered thoroughly aseptic, accomplished by the use of the actual cautery or by other satisfactory means.

The removal of the ovaries and tubes for these tumors, is supposed to act, by the early establishment of the menopause, partially by cutting off some of the blood supply. Many cases seem to be followed by cessation of previously profuse menorrhagia, and gradual disappearance of the tumor. In the hands of Mr. Lawson Tait, this treatment has been eminently satisfactory.

Occasionally this simpler operation has been attended with extreme difficulties in its performance, owing to the special adhesions of the ovaries, necessitating great care in the application of the ligature.

All operation commenced with the intention of removing the tumor entire, require a long incision through the abdominal walls, the length depending upon the size of the growth; it always should be sufficient to admit of perfect freedom of manipulations in the pelvis.

In all such cases, the intestines, even if empty as the result of the previous preparation already mentioned, certainly if distended, from any cause, will bulge into the abdominal incision and fill up the pelvis as soon as the tumor is withdrawn; they should be controlled and kept entirely out of the way by the usual methods already described.

INTRA-ABDOMINAL METHOD.

In the special technique of the intra-abdominal method with the formation of a stump after the tumor is delivered through the abdominal incision, the first procedure necessary is to execute what is called "tying off" the broad ligaments, and this requires great care, in order to avoid opening any of the large veins and to enable one to apply ligatures to the broad ligament for the permanent closure of all the vessels included in its folds.

It is done by seizing the broad ligament as close as possible to the uterus with the thumb and finger of the left hand at a point about half way down its lateral wall. With the right hand a pair of blunt pointed forceps are thrust through the ligaments between the fingers and the uterus and opened laterally; in this way a separation is made close to the uterus without opening any large vessels.

Through this opening a needle armed with a long double thread is passed. As soon as it is drawn well through, a sufficient length of it is cut off to answer the purpose of tying that portion of the ligament which is left attached to the tumor and towards its top. This ligature is tied as close to the top of the tumor as it can be drawn, and prevents bleeding from the uterine side of the broad ligament.

The needle is still threaded and lies inside of the outer portion of the ligament. The thread is drawn through the needle far enough to make a second double ligature.

The needle is then carried through the remaining outer portion of the broad ligament, at a non-vascular point, and this portion is tied in halves, just as one would tie the pedicle of an ovarian tumor. In this way all the vessels are securely fastened, and as the stump of the broad ligament is bisected by the ligature, it is very secure and little likely to slip.

This procedure is repeated in securing the broad ligament on the other side, and now the mass can be lifted out of the pelvis and we are ready to proceed to the next step of the operation which is to permanently close the vessels in the uterus and tumor previous to its separation. This is done by tying around the lower part of the tumor, as close as possible to the vaginal juncture of the cervix, a piece of rubber tubing. The rubber tube is as large as the middle finger, and when in position, should be drawn as tight as your strength will permit, its ends crossed once and secured temporarily at the point of crossing by a Nelaton forceps or a knot.

It is very essential to ascertain the position of the bladder before the rubber tube is fastened, in order to avoid including this viscus in its grasp. If the bladder is drawn upwards on the anterior surface of the tumor, it must be carefully dissected away from the tumor before the rubber is applied.

In cutting away the tumor, the incision should be sufficiently far away from the rubber to leave tissue enough outside of it to prevent the rubber from slipping over the end of the stump.

As soon as the rubber tube is in position, the tumor is removed by incisions through the uterine tissue anteriorly and posteriorly in such direction as to leave a stump in the shape of an inverted cone, the apex of the cone being towards the vagina. The cervical canal must now be thoroughly disinfected either by the use of the Paqueline cautery or 95 per cent. carbolic acid. The walls of this conical cavity are then sewed tightly together by interrupted sutures of catgut, introduced in a series from below upwards. These sutures should include a considerable portion of the uterine tissue, and should be tied very tightly in order to entirely control bleeding from the divided surfaces. The last row should be so placed as to invert the peritoneal covering of the uterine stump, by applying the peritoneal surfaces together throughout the length of the incision in the stump, so shutting off its cavity entirely from the peritoneal cavity.

As soon as these sutures are satisfactorily placed, the rubber tube should be removed. There should be no bleeding from the stump after the removal of the tube, if the manipulations have been rightly accomplished. After cleansing the peritoneal cavity, the abdominal incision is closed in the usual manner.

If no stump is to be left, the procedures are the same as have already been described up to the point of tying off the broad ligaments. Then by separating the folds of the broad ligament the uterine arteries are located and temporarily secured with forceps, and subsequently ligated, or permanently secured at once by a catgut ligature, carried beneath them with a curved needle.

After the uterine arteries are secured, the peritoneum, covering the anterior surface of the tumor, is incised across this surface above the top of the bladder and is pushed off the surface of the cervix as low as the vaginal juncture. A similar incision is made through the peritoneum on the posterior suface of the tumor, and it is peeled off in the same way from this side as low down as the vaginal attachment. These detached folds of peritoneum being held out of the way, the tumor is removed either by detaching it from the vagina entirely, or by dividing it through the lowest accessible point of the cervix.

During these manipulations especial care must be taken to avoid injuring the uterus.

To me, the method just described is the ideal operation for the removal of uterine myoma. It disposes entirely of the complications, primary or remote, arising from the formation of a stump, either extra or intra-abdominal; and it certainly diminishes the danger of infection from the uterine cavity, especially if the cervical canal has been curetted and rendered aseptic just previous to the operation.

In the extra-abdominal method the stump is fixed in the lower end of the external wound; or, according to the plan practiced by Dr. H. T. Byford, of this city, is turned into the vagina through an opening in the anterior wall of that cavity.

Fixing the stump in the external wound requires a long stump and hence a high division of the tumor. The technique of its performance is the same exactly as has already been described in the other methods as far as tying off the broad ligaments After this is accomplished, the rubber tube or cord is applied at the proper height on the tumor, so that when the abdomen is closed the rubber tube will be outside of the abdominal cavity without any tension on the stump. It is now in position and fastened so that the uterus can be divided and the tumor removed. In order to prevent the rubber cord from slipping it is proper to introduce a strong pin through the substance of the stump outside the cord.

Cases in which the tumor develops low down and implicates the cervix to such an extent as to prevent apparently the formation of a pedicle, can be managed safely in the following mnnner:

First. Apply the rubber cord as low down as possible, near the vaginal juncture, to control hemorrhage temporarily.

Second. Remove the tumor by an incision through its substance, without reference to its size, high enough to make the pedicle sufficiently long.

Third. Enucleate from the stump all the separate myomata, if there be any, or the myomatous tissue that may be found in it.

In the plan practiced by Dr. Byford, after division of the tumor, the bladder is dissected off from the stump of the tumor and the anterior wall of the vagina for a sufficient distance, a small opening is made into this wall by the thrust of a pair of scissors; this opening is enlarged to correspond to the size of the stump by tearing the tissues with the fingers; the stump is then turned into the vagina and the opposed edges of the peritoneal surfaces of the opening closed by the continuous catgut suture, thus leaving a perfectly clean peritoneal cavity. The stump is fixed in the vagina by a pair of forceps introduced through the external opening of this cavity.

The operation of *Myomotomy* or enucleation of the tumor from the uterine walls, is applicable in moderate sized tumors. After the exposure and management of the growth as already described, bleeding is controlled temporarily by the application of the rubber cord around the broad ligaments and cervix. The tumor is exposed by a free division through its external investment of uterine tissue; as soon as this incision is made the tumor can be enucleated from its bed with the finger. If the uterine cavity is not opened, the walls of the cavity, left by the removal of the tumor, are brought in close approximation by a successive series of interrupted catgut sutures commenced at the bottom of the cavity. The peritoneal edges of the incision are inverted and closed by a continuous catgut suture; when this is accomplished, the constricting rubber is removed, and if there is no bleeding from the stump following the removal of this cord, the external wound is closed in the usual way.

The use of electricity, according to the method advocated by Apostoli has quite a number of advocates and, in the hands of some surgeons, seems to certainly cause the disappearance of the mass. Success for this agent requires a special knowledge for its application according to the plans described by Apostoli. Its proper position in the relief of these growths has not as yet been positively determined.

The sub-peritoneal fibroid growths with well defined pedicles are quite readily managed by treating the pedicle in the manner already described as perfectly safe in securing the pedicle of an ovarian tumor.

It is surprising to what an immense size these sub-peritoneal tumors will sometimes develop with a very slender attachment to the uterine wall.

This specimen before you, weighing 42 pounds at the time of of its removal, was attached to the uterus by a pedicle of about four inches in width and half an inch in thickness.

This other specimen, weighing sixteen pounds at the time of its removal, had a still more slender attachment to the posterior wall of the uterus. In neither case was the body of the uterus distended in any way, and the pedicles were managed in the manner just advised. Both patients recovered.

The other specimen before you is a very interesting one; it is an instance of multiple fibroid degeneration of the uterus, which was successfully removed by the extra-abdominal method just described. It is especially interesting, because upon examination you will notice that it is at the same time a pregnant uterus, the fœtus having reached about the fifth month of development.

The condition of pregnancy in this case was recognized by the attending physician and the condition was readily confirmed by examination after the case came under my care for operation.

This large sub-peritoneal fibroid, almost detached from the rest of the tumor, occupied the pelvis and could not be displaced; in fact, it prevented me from determing the location of the cervix by any examination that could be made through the vagina. The operation was necessitated by the extreme suffering and evident exhaustion of the patient. The child could not have been delivered through the natural passage, either before or after coming to full term, even if the condition of the patient had not appealed for immediate interference.

Myomata, developed from the uterus, are frequently intra-ligamentous, pushing their way between the folds of the broad ligament and filling the cavity of the pelvis in their growth. Such growths are very troublesome in their management; the ureters are difficult to locate and extremely likely to be injured, as the cervix is usually implicated in these growths. The best plan of removal to be adopted, is complete ablation.

In these cases the uterine body is sometimes scarcely changed in size, and when the abdominal incision uncovers the tumor, the uterus is found carried up to the top of the mass. In one such case operated upon, the following plan was executed successfully and with recovery of the patient: The peritoneal covering of the mass was divided from one pelvic margin to the other, across the top of the tumor; the incision was deepened so as to open up the cellular tissue bed investing the mass. The fingers and finally the hand were introduced into this loose tissue, from which the tumor was rapidly enucleated, turned out and severed from the cervix close to the vaginal juncture. The divided uterine and ovarian arteries were secured with forceps and subsequently ligated; the edges of the investing peritoneum, after removing the tumor, were approximated easily and sewed together across the pelvis with a continuous catgut suture, leaving a perfectly clear peritoneal cavity. The recovery was without drawback.

There was a special condition present in this case to which my attention had never been called previously. The tumor in its development so completely filled the pelvis and reached downwards so far as to cause bulging of the perineum; it approximated the walls of the vagina so perfectly that that channel was practically closed; the function was so disturbed that the patient could not urinate voluntarily, and just before the operation it was with the greatest difficulty that a catheter could be passed into the bladder.

It is scarcely necessary that any special review shall be made of the technique of the operation called *Oophorectomy*, as the general directions already given must be carried out in any case in which the operation is supposed to be necessary for the relief of the patient.

With non-adherent ovaries the operation presents no complications in its performance and can be rapidly executed through a small abdominal incision and without any interference with, or exposure of the intestines. With displaced ovaries, bound down by adhesions, it may become an extremely hazardous and difficult operation, requiring much patience and skill to carry it to a successful issue.

Elevation of the uterus by means of pressure through the vagina, will sometimes render the necessary manipulations more easy of execution; adhesions are separated and managed in the manner already described, and the ligatures applied with the usual care.

If the ovaries are removed at all, it is well to include as great a length as possible of the Fallopian tubes outside of the ligature.

Operations upon the gall bladder are usually necessary for the relief of billiary colic caused by the passage of gall stones, or for the removal of these concretions, which have caused an obstruction of the ductus communis choledochus.

Two operations are commonly practiced:

First. *Cholecystotomy*, which is practically the formation of a temporary billiary fistula and the removal of the concretions from the gall bladder or the gall ducts, or the exposure of the gall bladder, opening into its cavity, removal of all gall stones and immediate closure of the wound in the viscus.

Second. *Cholecystectomy*, or the removal of the entire viscus with its contents, forming a pedicle out of the cystic duct.

Special means should be at hand, in both operations, to keep the intestines away from the field of operation and to prevent leakage into the peritoneal cavity, of the contents of the gall bladder. Attach strong silk threads to six small sea sponges to be used for this purpose by packing them around the gall bladder when exposed; the strings are for the purpose of keeping control of the sponges after their introduction and to provide for their removal. There should be at hand and ready for use, an aspirator with which to withdraw the fluid accumulations found in the gall bladder.

The best incision for the exposure of the gall bladder is the vertical one, carried from the margin of the costal cartilage on the right side directly over the center of the tumor, if a tumor be present. If no tumor be present, the incision should be made directly downwards from the tip of the ninth rib, and should be at least four inches in length; it should be carried for the same length by a free use of the knife, through all the tissues of the abdomen until the peritoneum is exposed at the bottom of the wound; all bleeding vessels should be secured in the usual manner before this membrane is opened, then the peritoneum is picked up between dissecting forceps, opened and incised to the same length as the abdominal opening.

The small sponges should now be packed around the exposed gall bladder, pushing the intestines well out of the way, and so placed as to catch any leakage from the gall bladder after it is opened.

Cases of retained gall stones which have existed for a long time and have caused a good deal of distress with disease and distention of the gall bladder, are apt to have pus mingled with the contents from infection, hence these contents are quite sure to be deleterious and should be prevented from entering the peritoneal cavity. As soon as the gall bladder is exposed and protected with the sponges as directed, its fluid contents should be drawn off completely by the aspirator. As soon as the walls become flaccid from aspiration, they are grasped with forceps on opposite sides of the addominal incision, and the viscus drawn out as far as possible into this opening.

When the aspirator fails to evacuate any more fluid it is withdrawn and the walls opened between the forceps already grasping the cyst, by means of the knife or scissors; this opening in the gall bladder should have the same direction as the opening in the abdominal walls, and should be extensive enough to admit the finger with ease. The gall stones should now be removed by means of a pair of dressing forceps or the old-fashioned bullet forceps; it is to be remembered that gall stones are remarkably light and brittle, and if they are to be removed without breakage, they must be handled very carefully.

Taking advantage of their lightness one can succeed in removing a stone that eludes the forceps, by means of a forcible current of water thrown into the cavity of the bladder from an irrigator; the stone floats on the water and is lifted out of the opening in the over-flow.

Billiary calculi are frequently found impacted in sacculi of the bladder walls, in the cystic duct or the common duct, and are very troublesome to remove; the tubes, dilated for their passage as they are forced onwards by accumulation and contraction behind them, fall together in their rear so that they may become fixed in their position and cannot be squeezed backwards into the gall bladder or onwards into the intestine. Sometimes they can be dislodged from their position in the grasp of the bladder or duct walls, by tearing these walls away from them with the pulp of the finger, so that they can be seized with forceps and removed; at other times they can be crushed in situ by being grasped through the abdominal cavity in forceps, the jaws of which are padded and prevented from doing harm to the investing tissues by drawing sections of rubber tubing over these jaws. Being so very brittle, the application of slight force is sufficient to crush and pulverize them to such an extent that their debris is floated back into the gall bladder and discharged from the external opening; or their destruction having rendered the common duct patulous, this debris is carried on into the duodenum.

After the bladder is emptied of its contents and concretions the edges of the incision in the bladder walls are sewed to the peritoneum of the abdominal incision by a continuous catgut suture, thus shutting off the cavity of the gall bladder from the cavity of the abdomen.

A large drainage tube, properly perforated, is introduced into the cavity of the gall bladder to allow of the easy exit of the extremely free flow of bile and serum which comes on immediately. The sponges are removed and the abdominal incision closed in the usual manner. A very massive external dressing is required to absorb this discharge.

The sutures in the abdominal walls are removed at the end of a week or ten days; the drainage tube is allowed to remain in the gall bladder until bile has resumed its normal course indicated by the color of the fæces, or the amount discharged through it has greatly diminished in quantity.

At the end of two weeks the wound in all its parts will be firmly cicatrized and, if desirable, the tube can be removed. The fistula soon closes if the patulency of the common duct has been restored; if this latter result does not ensue, the fistula becomes a permanent one but it is of little consequence or annoyance to the patient as compared with the extreme suffering which the operation has relieved.

In some cases in which the common duct is certainly patulous at the time of the operation, after the removal of the foreign bodies the opening in the gall bladder is immediately closed by inverting its edges and closely approximating its peritoneal surfaces by means of continuous catgut suture. This method of procedure has been followed by success in some instances, in others the sutures in the gall bladder have given way, allowing bile to be discharged into the peritoneal cavity, causing a fatal peritonitis. The attachment of the bladder walls to the external opening is the safest method to adopt.

In performing the operation for cholecystectomy, the technique is exactly the same as that already described for cholecystotomy, as far as the exposure of the gall bladder and the introduction of the sponges for its isolation. When this operation is advisable, the viscus is usually found much contracted and diminished in size; it is entirely freed by separating it from the under surface of the liver and detaching any adhesions which may be present, by means of the finger, the knife or the scissors, until the narrow cystic duct is fully under control; this duct is then tied by throwing a silk ligature around it as far inwards from the gall bladder as possible; the duct is then divided outside of the ligature and the gall bladder is removed. Some means to disinfect the stump of the divided cystic duct should be used, such as touching it with pure carbolic acid or tincture of iodine.

The stump is inverted or covered by a few Lemhert stitches. The sponges are removed and the external incision closed. A strand of iodoform gauze is left in contact with the duct and carried out through the angle of the wound to act as a drain in case the ligature or duct should give way.

PANCREATIC CYSTS.

My experience in surgical operations for the relief of pancreatic cysts, consists of the treatment of four cases; they were all of large size, and the technical procedure was the same in all cases. They all recovered and so far have had no manifestations of the return of the disease.

As these cysts develop behind the peritoneal cavity the posterior layer of the peritoneum must be divided before the cyst wall is exposed. The abdominal incision in each case was vertical in direction and made over the center of the most prominent part of the tumor, and of sufficient length to give ready access to it; this incision was made in the manner already described for all abdominal incisions as far as the opening of the peritoneal cavity.

The tumor presents in this opening, probably crossed by some portions of the intestinal tube and covered by layers of the mesentery, through which are seen large mesenteric vessels. If possible the intestines and mesentery are pushed off the surface of the tumor or so displaced, that its presenting surface is invested only by non-vascular tissue; this is incised sufficiently to allow the cyst wall to be brought in contact with the edges of the abdominal incision. The peritoneal edges of the abdominal incision are then fastened to the surface of the cyst to the necessary extent by a continuous suture; the remainder of the abdominal incision not included in this attachment is then closed by interrupted sutures. By this procedure the cyst wall is attached to the abdominal wall and the peritoneal cavity entirely closed.

The cyst is then opened and its contents discharged; if thought advisable the cyst cavity can be packed loosely with iodoform gauze, for the purpose of drainage.

Perhaps the future care of the cyst cavity can be best provided for by the introduction into it of two large and long drainage tubes, one perforated and the other not perforated; these tubes will provide for the drainage and allow for thorough irrigation of the cavity in case it should become infected. The external dressings will be the usual application of antiseptic gauze and borated cotton; the drainage tubes must be retained in position for a long time, as the cyst cavity is so slow in contracting and granulating, and the fluid should not be allowed to re-accumulate.

PYOSALPINX.

The accumulation of pus in the Fallopian tubes or ovaries, or both, sometimes complicated with rupture into the pelvis or the organs contained therein, often requires surgical operation for its relief. The communication between the pus cavity and the cavity of the vagina or rectum, especially the latter, adds much to the gravity of the operation and to the difficulties of operative technique.

When rupture of the pus sac has occurred, extensive adhesions are usually found present; it is really surprising how readily such adhesions are peeled off the distended tube when the surgeon, taking the uterus as a guide, can insert his finger between them and the sac wall; free bleeding occurs during the separation of such adhesions, but usually stops spontaneously or is readily controlled by sponge pressure.

If the distended sac is free from attachments to the surrounding organs, or can be isolated without rupture and a sufficient portion of the broad ligament exposed to form a good pedicle, a silk ligature is applied in the usual way, tied and the entire mass removed.

Total removal of the diseased tube or ovary is the best treatment to aim at, and the attempt to execute it should be made, even when great risks attend it, or at first glance its performance seems impossible; by persistence and steady progress, one often succeeds satisfactorily in seemingly hopelessly bad cases.

If the risk attending the entire removal seems too great, a portion of the highest part of the sac wall should be cleaned of investing tissue, it should then be emptied of its contents by the aspirator, after which the sac wall is sewed to the peritoneum of the edges of the abdominal incision by the continuous catgut suture. To shut off the peritoneal cavity the still open portions of the abdominal incision should be closed by interrupted sutures; then the pus cavity should be opened freely through its exposed portion and the interior thoroughly irrigated with some antiseptic fluid. A glass drainage tube is introduced into the cavity of the sac, and a large external dressing applied. The drainage tube is kept in until the pus cavity is obliterated by contraction and granulation.

Sometimes it is advised to make a counter-opening into the pus sac through the vagina in order to facilitate drainage and provide means for perfect irrigation. My experience has not shown that this plan possesses any superior advantages; in fact it has seemed to me that the cases in which it has been tried, have not recovered as rapidly as those in which no opening was made into the vagina.

It is especially necessary in all operations for the relief of pyosalpinx to draw the folds of the small intestine out of the pelvis, if they are found non-adherent, or after their separation, if adherent to the pus sac, and the use of sponges or pads made out of iodoform gauze placed around the field of operation to isolate the pelvis entirely from the rest of the abdominal cavity. These precautions are strenuously advised owing to the extreme likelihood of rupture of the distended sac walls and the dissemination of foul pus contained in them into the pelvis, as well as to allow of free flushing of the pelvic cavity to get rid of it. This plan should always be carried out before the pus sacs are manipulated and before any adhesions are loosened. Many times the strict observance of the rules and practice of the procedures advised, have carried particularly bad cases of the nature under consideration to a successful issue. In these cases, if anywhere, the adoption of free drainage seems to be imperatively demanded. In many cases the bladder is so drawn out of position that it is extremely likely to be injured.

Circumscribed accumulations of pus are certainly found in the pelvis at times with agglutinated folds of intestines, or other organs and tissues, for their walls, and without any determinable direct communication with the Fallopian tubes; they constitute the condition to which the name of pelvic abscess is applied. The amount of pus accumulation is sometimes very great. These abscesses do not infrequently make an external opening for themselves, by means of adhesions or tissue necrosis, through some parts of the abdominal wall, oftenest in the inguinal region. Occasionally the surgeon is able to locate them rather early in their formation by abdominal section and cure them by carrying out the procedures already described for the management of cases of pyosalpinx in which adhesions cannot be separated and the sac removed entire.

When these accumulations of pus approach the surface at any point, as indicated by the presence of redness, œdema of the surface and perhaps fluctuation, they should be treated like any deep seated abscess.

Of course it is understood that all minute details of operative manipulation, already passed in review in the consideration of the technique advisable in all abdominal operations, are to be observed in all the procedures applied to special cases or conditions.

Extra-Uterine Pregnancy.

Cases of extra-uterine pregnancy before term, with or without rupture, are referred to the surgeon for operation; the special manipulations necessary for their successful management demand of the surgeon well defined plans of procedure, in order that they may at any moment be put into rapid execution. The surgeon will never be confronted with operations calling for greater skill, promptness and readiness of action than the one which he must face when asked to relieve and surmount the imminent danger of immediate death attending many cases of ruptured Fallopian pregnancy. It seems proper to look upon all cases of extra-uterine pregnancy as cases of dangerous tumor, and to consider the propriety of their removal in anticipation of hazardous complications or accidents threatening the life of the patient.

As is well known, the rupture is most likely to take place about the second or third month of the term of development. If the site of rupture is towards the abdominal cavity, the hemorrhage is sudden, profuse and often deadly. If the rupture is towards the broad ligament tissue, bleeding is not so profuse and is usually soon limited by the pressure of the distended folds of that ligament.

Careful diagnosis having established the existence of an unruptured tubal pregnancy, the operative procedures for its removal present no complications. The abdominal incision, exposure of the tumor, ligation of its base and its excision are to be made with the same precautions and with the observance of the same rules as have been already indicated as necessary and sufficient to accomplish the removal of any small tumor situated in the abdomen. When the rupture has occurred on the free surface of the tube and the blood is rapidly flowing into the abdominal cavity, as indicated by the well defined symptoms always present in such an occurence, every manœuver of the surgeon must be executed with great rapidity and yet with great certainty. The abdominal opening is made quickly and as soon as the peritoneal cavity is exposed the uterine end of the distended Fallopian tube is immediately seized with the fingers and included in a ligature passed under it by means of a curved needle, and securely tied. The tissues of the broad ligament towards the free ends of the Fallopian tubes are secured by a ligature applied in the same way; these ligatures stop the bleeding at once and thus get rid of the main element of danger. After this the mass of effused blood can be cleaned out of the way and the ruptured tube, with or without the fœtus, removed with deliberation and safety.

The peritoneal cavity is thoroughly cleansed and the opening in the abdominal walls closed in the usual manner. No drainage is to be used if its use can be avoided; if such uncontrollable oozing of blood is present, the Mickulitz gauze drain should be introduced; its pressure will stop the oozing and its presence provide for the drainage; it can usually be removed safely by the third day.

In bad cases the terrible effect of the great blood loss can be in part relieved by the injection of large quantities of solution of common salt, in the proportion of one teaspoonful of salt to a quart of sterilized water, into the cellular tissues of the back, or less quantities into some easily exposed vein.

The abdominal incision is usually best made in the mid line, as giving more certain control of the Fallopian tubes when the diagnosis of which tube is the seat of pregnancy has not been made. I made the lateral incision in one successful case, directly over the most prominent part of the swelling, and the necessary manipulations were readily carried out through it. This is the specimen removed from the case, and on the surface of this mass of blood you will notice the body of the fœtus at the third month of development, rather firmly held in the lamina of the clot.

More deliberation can be practiced in the cases of rupture into the broad ligament, as the loss of blood is not an element of so much concern.

In another case of this variety of rupture, the following plan of manipulation was practiced: After opening the abdomen, cleaning out much loose blood from the cavity and exposing the tumor, an incision was carried through the broad ligament investing the top of the tumor, from the uterus to the lateral portion of the brim of the pelvis, its course running parallel with that of the Fallopian tube; the fingers were introduced into this incision and the entire mass of blood clot, as you see it in this second specimen, enucleated from its bed between the folds of the broad ligament. No blood vessels required ligation. As there was some oozing of blood into the cavity left, that cavity was packed with strips of iodoform gauze, the ends of which were drawn out of the lower end of the abdominal incision and this incision closed by interrupted suture; the gauze packing was removed on the third day and the case went on to rapid recovery.

Other cases of rupture into the broad ligament are best managed by the application of a ligature at both ends of the Fallopian tube and a removal of the diseased portion of the tube, together with all the blood clots, in the manner already described for the control of cases of rupture on the free surface of the tube. Many cases of successful termination, after operation for ruptured extra-uterine pregnancy, have been reported. Nine cases have been operated upon by myself with recovery in all.

Extra-Uterine Pregnancy, Near, At, or After Term.

After safely passing through the extreme dangers attending rupture, in the earlier months of its development, an extra-uterine pregnancy may remain present in the patient so affected with symptoms of greater or less trouble for remarkably long periods of time, even for many years after the child has reached full term and died. Complications of one kind or another during any time of its existence, may happen and require surgical operation. The most certain necessity for such interference will follow as the result of purulent infection of the fœtal sac or its contents, after full term of development. Probably the most favorable time for operation in the majority of cases will be about the third month after the child has reached full term, and its death has occurred, accompanied with well marked symptoms of futile labor and been followed by diminution in the size of the tumor from absorption of the amniotic fluid.

Probably, as well, at the end of this same period, partial separation of the placenta will have occurred, or its blood vessels have become so much contracted in size as to diminish or obviate entirely one of the greatest dangers attending operation in these cases, that is, primary or secondary hemorrhage following separation of the placenta. Aside from hemorrhage, the largest fatality has attended the operation in former years from septic peritonitis, which complication can now be almost certainly avoided by carrying out in detail, aseptic and antiseptic precautions and procedures before, during and after the operation.

Spontaneous discharge of the fœtal contents and recovery, have not infrequently followed through the means of the formation of adhesions, ulceration and rupture into the alimentary tract, uterine cavity, vagina, or through the abdominal walls, accompanied in most cases by severe pain, extreme exhaustion and prolonged periods of severe constitutional symptoms dependent upon the presence of the suppurative process.

Operative procedure may be divided very properly into the *minor* and *major*, the latter having for its object the removal of the entire sac and its contents; the former accomplishing merely the removal of the fœtus and the attachment of the edge of the opening into the fœtal sac to the margins of the abdominal incision, accompanied either with the removal of the placenta at the time of the operation, or the adoption of the plan of allowing it to remain for the gradual separation which follows contraction of the sac and its decomposition.

The type of extra-uterine pregnancy, whether it be Fallopian or intra-ligamentous, exercises much influence upon the choice of the operation to be performed. It is scarcely probable that this condition can be accurately estimated previous to making abdominal incision. If after the abdomen is opened the tumor is found to be free from adhesions and pedunculated, as may be the case in the Fallopian or ovarian type, the *major* operation is the best one to adopt; the pedicle, if one is present, is ligated as for any tumor, and the mass removed; or if none be present, a pedicle is formed of the investing tissues by partial enucleation and treated as already described in controlling the pedicle and during the subsequent details incidental to the care of the case. If no pedicle is present and it is not possible to form one, or if the adhesions are insurmountable or the case is of the intra-ligamentous type, it is best to perform the *minor* operation, which consists in fastening the surface of the fœtal tumor into the abdominal incision by a continuous catgut suture. As soon as this is accomplished and isolation from the peritoneal cavity made perfect, the fœtal sac is opened by a free incision and the child delivered through it.

If the placenta is to be delivered at once, the blood vessels leading into it should be ligated by means of deeply applied silk sutures before any attempt is made at its separation. Otherwise, the cavity of the fœtal sac is best packed with iodoform gauze and kept free from septic infection until the contraction of the sac has separated the placenta and cast it loose.

Both in the intra-ligamentous and other varieties, the anterior surface of the fœtal sac is sometimes blended intimately with the abdominal walls from adhesions so that they are practically continuous tissues. If this condition is present, no attempt is made to separate these adhesions, but the incision through the abdominal walls is carried directly into the cavity of the fœtal sac; the child is delivered, the cavity filled with iodoform gauze and the separation of the placenta awaited. In all cases in which the cavity is filled with the gauze, this material is withdrawn and replaced often enough to secure an aseptic condition of the cavity. As soon as the placenta is entirely detached and removed, the sac contracts and granulates rapidly and the patient goes on uninterruptedly to complete recovery.

Anticipating by a few days the futile labor which marks the full term of development in the child, or by selecting the time of this occurrence itself, operative interference will be rewarded with the delivery of a living child. In these cases the danger from primary hemorrhage, attending any attempt to separate the placenta should lead to the avoidance of any active interference to accomplish this result. It is best to practice delay of separation of the placenta and to make use of the gauze packing, unless a pedicle can be formed and the entire sac removed.

CÆSARIAN SECTION.

The very formidable operation of Cæsarian section of late years has been attended with remarkably favorable results, owing to the avoidance of septic infection and a more perfect recognition of the minute details necessary for its successful performance.

There is recognizable in the cases reported, a well defined line of demarkation between two varieties presented for operative interference. First, those which are under control of the surgeon previous to the commencement of labor, which are very likely to be free from septic complications and hence recover. Second, those in which the operation is resorted to some time after labor has commenced, and especially those in which attempts have been made to deliver the child through the natural passage, which cases are very likely to develop septic complication leading to death. In the latter variety, it must be always remembered that there are two sources from which sepsis may arise. First, through the abdominal wound and its environs; second, through the certainly infected uterine cavity. The first source of danger from sepsis belongs to both varieties of cases.

While the precautions must be assiduously carried out to prevent infection through the abdominal wound in both classes, in those in which the uterine cavity has been opened and interfered with previous to the operation, the surgeon is called upon to practice extreme care in the disinfection of this cavity.

After carrying out all the antiseptic precautions previous to making the abdominal incision, the vagina should be thoroughly irrigated with some antiseptic fluid.

Labor having commenced previous to the operation and proceeded so far as to partial or complete dilation of the cervix, the membranes are ruptured and the amniotic fluid allowed to drain away. If this fluid has already escaped without dilation of the cervix, this dilation should be secured by means of Barnes' dilators, or other well known methods.

INCISION.

The incision through the abominal walls should at once be made long enough to admit of easy delivery of the distended uterus and will require prolongation above the umbilicus to meet this necessity. All bleeding from the wound should be controlled permanently before the peritoneum is opened.

After the peritoneum is divided to the extent of the external incision, the uterus and contents should be extruded from the wound by means of pressure through the abdominal walls over its posterior surface; as soon as it is delivered the intestines should be protected by the introduction into the abdominal cavity of large, flat sponges.

The uterine wall should be then incised to a sufficient length to allow the delivery of the child; it should be made vertical and in the mid line of the anterior surface, if possible not including the tissues of the cervix at its lower end. During its performance, hemorrhage is very free and should be controlled as much as possible by sponge pressure.

Some care must be used while dividing the uterine mucosa to avoid wounding the child.

Just before opening the uterine cavity the edges of the abdominal incision should be made to constrict the uterine body in order to prevent any of the contents of the uterus from flowing into the abdominal cavity. A rubber tube should be placed around the cervix in the hands of an assistant who will tie tightly after the uterus has been incised in case of severe hemorrhage.

When the incision through the uterine walls is sufficiently free to allow of easy extraction of the child, this should then be seized and rapidly delivered; the umbilical cord should then be caught with two pairs of forceps and divided between them and the child handed to an assistant, with instructions to practice immediate artificial respiration and other means of resuscitation, if it does not cry lustily immediately upon being withdrawn.

The surgeon should now practice free ablution of his hands.

The bulk of the uterine mass diminishes rapidly by contraction of its muscular walls after delivery of the child.

During all this time the assistants are directed by means of compression, to limit as much as possible the loss of blood and to prevent the entrance of any deleterious material into the pelvic cavity.

The placenta is separated from its attachments to the uterus with the finger, and with attached membranes slowly and carefully drawn out of the opening.

If the contractions of the uterine muscle are normal and strong, the tumor soon becomes reduced to a small size, hard and firm, the incision in its walls becomes remarkably shortened and the blood flow stopped. This condition can be expedited, or in cases of atony induced, by the hypodermic injections of twenty-drop doses of fluid extract of ergot; or by douching its cavity with hot sterilized water.

If the uterine cavity has been opened and rendered septic before the operation, it should be thoroughly washed out with some antiseptic fluid, such as hot Thiersch's fluid, or hot solution of 1-5000 bi-chloride of mercury, followed by sterilized water. The water flows out readily through the dilated cervix and makes its exit through the vagina.

All blood and other material should now be sponged away from the uterus and surrounding parts. Before closing the uterine incision a strand of iodoform gauze as thick as a finger should be carried through the uterine cavity into the vagina.

The uterine incision is closed by means of three rows of interrupted silk sutures, the first row passed through the muscularis of the uterine walls, just outside of the mucous membrane; these sutures should be more than half an inch apart. The second row should bring together the middle portion of the muscular wall of the uterine incision, and the third row should include the outer layer of this muscular wall. The edges of the peritoneum should be brought together over all, by means of the continuous catgut suture, so applied as to invert its edges and bring free peritoneal surfaces in contact with each other throughout the length of the incision. If these sutures are all satisfactorily applied, there will be no bleeding from the wound after their introduction.

The peritoneal cavity is properly cleaned, the external wound closed by interrupted sutures and the patient cared for in every way, as after any other severe laparotomy.

PORRO'S OPERATION.

Any severe operation upon a patient requiring a complete ablation of the pregnant uterus, such as is contemplated and practiced in the performance of Porro's operation, should be preceded by all the special and general preparations of the patient, to prevent the occurrence of sepsis, which have already been described.

The surgeon should previously have prepared several rubber bands or a Kœberle's serrenœud or other clamp, with which to compress the stump and control hemorrhage.

The cervix should be partially dilated, membranes punctured and the amniotic fluid allowed to drain away, if this has not already occurred.

The abdominal incision must be long enough to admit of the easy delivery of the entire tumor, and made in the same manner as the similarincision in making a Cæsarian section. The delivery of the uterus and contents, as also the control of the intestines and protection of the abdominal cavity, should be managed as already mentioned.

After the delivery of the tumor the broad ligaments are "tied off" in the same manner as has been minutely described during the performance of the operation for ablation of a fibroid of the uterus. As soon as this is accomplished the cervix is surrounded by the rubber cord, which is drawn tightly enough to control all bleeding, tied once and temporarily secured with a Nelaton forceps. The uterus is then opened, the child and the placenta with its membranes delivered. After this the uterus is severed and removed. The uterine canal should now be disinfected by the use of strong carbolic acid or the actual cautery, and then packed with a small strand of iodoform gauze. The incision through the uterus, for its ablation, should be sufficiently far away from the rubber tube to prevent the tissues of the stump from being drawn through that tube; the stump should be cut long enough to allow of its being fastened in the lower end of the incision without dragging on the vagina. If the rubber cord is not high enough on the stump to come outside of the abdominal cavity, a second rubber cord should be applied in such position as will accomplish this result, drawn sufficiently tight to control bleeding, tied and permanently fastened by silk sutures introduced through its knot. If the rubber tube is not to be used as the permanent means of constriction of the stump, then Kœberle's serrenœud or some other clamp, is applied in such position as to be outside of the abdominal cavity, fastened securely and the temporary rubber tube removed. In both instances, my partiality is for the use of the rubber tube; its action is constant and persistent, does not necessitate repeated disturbance of dressings, such as is necessary in order to tighten the clamp to accommodate it to the constantly diminishing size of the stump tissue contained in its grasp.

When the stump is satisfactorily controlled, by either of the methods above mentioned, it is secured in the lower end of the abdominal incision, by attaching the peritoneum of the stump to the parietal peritoneum by means of a continuous catgut suture carried around the entire circumference, thus shutting off the abdominal cavity completely.

During all these manipulations much care should be taken to avoid injuring the bladder.

The protecting sponges should now be withdrawn, the peritoneal cavity cleansed and the abdominal incision closed by interrupted sutures. The free end of the stump is cauterized with the actual cautery or mummified by being covered with a thick layer of iodoform powder and the usual external dressings are applied.

The subsequent management of the case should be in accordance with the rules already given in describing the technique of a case of myoma of the uterus, treated according to the extraperitoneal method. In cases in which the uterine cavity is presumably septic this method is much safer than the one described above.

OBSTRUCTION OF THE BOWEL.

Laparotomy for the relief of obstruction of the alimentary tract from any of its many causes, is an operation of not infrequent necessity and quite hazardous in its nature.

It seems proper to recommend the choice of the mid line of the abdomen for the primary incision in all such operations, as this median incision gives the most perfect command of all portions of the abdominal cavity, and hence secures greater certainty for at once reaching and properly managing the source of obstruction.

As many of these cases, when operation is required, are accompanied with extreme tympanitis from gaseous distention of the intestinal tube above the point of strangulation, their difficulty of management is immensely enhanced by the existence of this complication.

As the folds of the distended intestine are forced into close contact with the abdominal walls, the incision which finally opens the abdomen should be made with great care in order to avoid injury to them. If there is not much gaseous distention, as soon as the abdominal incision is completed, folds of collapsed intestine should be sought for and followed upwards till the point and cause of the obstruction is reached. In the majority of cases the point of obstruction will be found in the right iliac region.

The cause of the obstruction is very often found to be narrow and tense bands of adhesions, and they should be divided and the intestine released. Sometimes it is caused by a fold of intestine slipping beneath the vermiform appendix, which has become adherent by its free extremity only; if the intestine cannot be withdrawn from the loop thus formed, the appendix should be divided between two ligatures and special precaution taken to avoid infection from its cavity.

Sometimes the strangulation is due to an internal hernia of a loop of the intestine through some abnormal opening in the mesentery or omentum. This opening should be enlarged and the intestine withdrawn and the abnormal opening closed by sutures.

Again, the strangulation is due to the presence of a twist of the intestinal tube or volvulus, oftenest occurring at the site of the sigmoid flexure. The axis of the tube must be restored to its normal position by untwisting the coils concerned in the formation of the volvulus.

If the obstruction is due to the presence of a malignant growth in the intestinal tube, two operations are at the choice of the surgeon for the relief of the patient. First, the establishment of an anastomosis between portions of the tube above and below the site of the constriction. Second, the entire removal of the tumor through an enterectomy, performed by severing the bowel through healthy portions above and below the tumor and restoring the continuity in the intestinal tube by suturing together the ends just made

If the obstruction is due to an intussusception of rather recent occurrence, the tumor thus found is drawn out of the abdominal incision and the intussusception overcome by pressure upon the invaginated contents from below rather than from any forcible dragging upon the invaginated tube from above. If adhesions have formed between the folds of the intussusception and are sufficiently firm to prevent its reduction in the manner just indicated, the surgeon will be compelled to consider the propriety of making an entire resection of intussuscepted mass, and the subsequent restoration of the continuity of the alimentary tract by rejoining the resected ends by suture, or the propriety of the establishment of an anastomosis between the small intestines above and the large intestines below the invaginated portion. Neither operation presents much prospect of successful relief as an encouragement for its performance. If the existence of great gaseous distention of the tube presents any obstacle to the successful execution of the procedures indicated as necessary to overcome the obstruction, this complication must be relieved by some special procedure. It is said that repeated washing out of the stomach by means of the stomach tube previous to the laparotomy tends to relieve the distention. As this is a simple procedure and can be easily carried out, it should be practiced in all proper cases.

After the abdominal incision is made the distended coils of intestines may be withdrawn through the external opening, held out of the way and protected by towels wrung out of hot aseptic solution. As soon as the constriction is relieved the accumulated gas will flow into the previously undisturbed portion and allow of their easy return into the abdominal cavity. When the distension is so extreme as to prevent the adoption of any other method for its relief, the coils of intestine must be punctured at non-vascular portions by means of a hypodermic needle and the accumulated gas allowed to escape.

Cases of obstruction which have reached the condition of extreme exhaustion, almost collapse, with excessive distention, can sometimes be quickly relieved temporarily and time secured for the performance of subsequent operation for permanent relief, by a simple operation. A moderate incision is made through the abdominal walls and the first fold of intestine met with, seized and brought through the external incision; its walls are fastened to the edges of the external incision and its cavity opened, thus establishing a fæcal fistula, out of which the contents of the tube can flow, and thus the immediate symptoms will be relieved.

During all these procedures the intestines must be handled with extreme care, as their thin walls, weakened from inflammation and distention, are particularly liable to tear under even slight pressure. After accomplishing the relief of the obstruction the external wound is closed in the ordinary manner and the usual antiseptic dresssings applied.

Appendicitis—Peri-Typhlitis—Peri-Cæcal Abscess.

Operative interference through the abdominal walls, for the relief of the diseased conditions of the vermiform appendix, has of late assumed considerable prominence and has been practiced with a corresponding frequency. When determined upon for the relief of disease unaccompanied with the presence of adhesive peritonitis or the formation of pus, the technical manipulations are comparatively easy of execution. On the other hand, when infection has taken place in or around the appendix, together with gangrene or rupture of its walls, accompanied with more or less peritonitis and extensive adhesions between coils of intestine, the means of relief are extremely difficult to carry out and haazrdous in their nature.

The region of operative interference, in either case, is properly exposed and the appendix is most readily uncovered by means of a vertical incision carried through the abdominal walls, about two inches to the inner side of the anterior superior spinous process of the ilium; the middle point of the incision should be directly opposite to the spine. All bleeding vessels should be secured before the peritoneum is opened, after which, this membrane is divided to the full length of the incision. As soon as the abdominal cavity is opened, provided infection has not taken place or abscess formed, coils of intestine will push into the wound, and should be held out of the way by placing sponges or pads of iodoform gauze so as to restrain their exit and yet leave the cæcum fully exposed to view. The vermiform appendix is then sought and is usually easily recognized by its well known shape and characteristics; if non-adherent, its mesentery is ligated and detached until perfectly free at its origin from the bowel. The appendix is then ligated firmly by a silk suture close to its origin and detached by an incision sufficiently far away from the point of application of the ligature. The mucous membrane is then destroyed and rendered absolutely aseptic by touching it with 95 per cent. solution of carbolic acid applied by means of a silver probe; any superabundancy of the acid can easily be shaken off this probe, and yet after being well shaken enough of the acid adheres to its surface to accomplish the purpose desired without any danger from the caustic action of the medicine extending beyond the immediate point of its application.

It has never seemed necessary to me, to resort to the more prolonged procedure of inverting the stump of the appendix into the cavity of the cæcum, and uniting opposed surfaces of the cæcum over the invaginated stump, as is recommended by some operators, at least in the several operations done by myself for the removal of this organ, the simpler procedure mentioned has given rise to no complications. Fæcal fistulæ have been attributed to the fact that this precaution was not carried out, but it is quite likely that they were caused by an injury to the cæcum during the operation; none of my cases were followed by formation of fistula.

When the previous inflammation has led to the formation of many adhesions and to abscess, after the abdomen is opened according to the plan directed, the appendix is often very difficult to find, or to be freed entirely so as to be safely removed, even after the careful and prolonged manipulations required to separate the adhesions. The danger of breaking through the adherent intestine is very great.

Not infrequently, when considerable pus is present, the appendix is found greatly enlarged and more or less softened and gangrenous, but free in the cavity of the abscess. In both varieties it is frequently found closely adherent throughout its entire length and is freed with great difficulty. In one of my cases its mesentery was found so infiltrated and softened by exudate and inflammation that the tissues would not hold a ligature, and the spurting arteries could not be secured thereby; they were caught in a pair of hæmostatic forceps and these were left in the wound until the second day, when they were removed, restraining hemorrhage perfectly; the patient made a rapid recovery.

In pus cases the main abdominal cavity should be completely isolated from the site of the abscess by means of iodoform gauze pads before the latter is opened, and the pus thoroughly cleaned away by means of flushing with sterilized water.

In all cases, the appendix, when separated, can be satisfactorily removed according to the method already given. Great care should be used in cleansing the entire wound, after which, a strip of iodoform gauze may be carried to the stump of the appendix and out of the lower end of the abdominal incision, to act as a drain; after which the external wound is closed in the ordinary manner and the proper dressings applied.

Abdominal Nephrectomy.

The external incision for this operation is made through the linea semi-lunaris in the usual manner common to all operations which open the peritoneal cavity. The intestines are pushed out of the way by means of a large flat sponge.

As the tumor is behind the posterior layer of the peritoneum, this layer, too, must be incised before the tumor is exposed. The colon, in these cases, usually lies on the top of the tumor and the incision which opens the posterior layer of the peritoneum should be made some distance away from the outer edge of the colon and parallel to it. It must be of sufficient length to allow the operator to have complete control of the tumor, and to provide for its easy removal. The sponge is then withdrawn and the inner edge of the incision of the posterior layer of the peritoneum sewed securely to the inner edge of the incision through the abdominal walls; in this way shutting off completely the peritoneal cavity from the field of operation. The blood vessels entering the tumor are now sought and ligated. The ureter is found and secured temporarily by forceps, the tumor separated from its attachments and removed.

It is just as well if the tumor is rather large and the space limited, to secure the blood vessels temporarily by long jawed forceps, as they can be ligated inside of these after the removal of the tumor.

It seems best to always provide for drainage through the posterior lumbar region; this can be done easily and without fear of hemorrhage by thrusting a pair of scissors directly backwards to the interval between the last rib and the crest of the ilium and expanding their blades to make an opening through which a large drainage tube can be readily drawn.

After the removal of the organ. the ureter may be managed in either of two ways. Its free end is made thoroughly asceptic by the application of the actual, cautery or pure carbolic acid, and it is drawn out and fastened to the most dependent part of the external wound; or its extremity may be inverted into its lumen, like the finger of a glove, and the peritoneal edges fastened by suture.

After the tumor is removed and the manipulations mentioned satisfactorily carried out, the edges of the posterior layer of the peritoneum which was sewed to the abdominal wound is unfastened by snipping the sutures. The sponge is again used to keep the intestines out of the way while the incision in the posterior layer of the peritoneum is secured closely by means of the continuous catgut suture, thus perfectly isolating the peritoneal cavity from the large space recently occupied by the tumor. The abdominal wound is sutured in the usual manner, the sponge removed, and the external wound closed.

Fæcal Fistula.

Abdominal section for the relief of fæcal fistula is the final resort in cases of that unfortunate complication. After the abdominal incision is made in the usual manner and with the usual precautions, the fold of the intestine implicated in the formation of the fistula is freed entirely from its adhesions to the abdominal walls and if necessary from surrounding folds of intestine; the opening in it is then closed accurately by means of Lembert's intestinal stitch, which inverts the opening into the lumen of the bowel and approximates opposed surfaces over it. The fistula through the abdominal walls is then freely abraded and united by suture. It is well to place a strand of iodoform gauze in contact with the intestine at the seat of operation and carry it out through the abdominal wound. This will act as a guide in case the stitches should give way and will prevent the occurrence of general peritonitis in that event.

CHOLOSTOMY.

The operation for the production of a temporary or permanent fistula into the large intestine through the anterior abdominal walls, may be done either over the course of the descending or ascending colon. The opening in the bowel is usually made near the end of the descending colon and is termed Maydls' operation; it is best executed according to the following plan: an incision three inches in length is carried through the abdominal walls in the direction of the external oblique muscle over the well known course of the bowel and at its lower part in the left inguinal region. When the opening through the abdominal walls is completed, the peritoneum is sewed accurately to the skin throughout the entire circumference of the wound by means of the continuous catgut suture. After the abdomen is opened, the colon is easily recognized by its sacculated formation and striæ of longitudinal muscular fibres; the colon is seized and drawn into the external wound, its meso-colon is transfixed with a glass or a hard rubber rod covered with iodoform gauze. This rod is allowed to project over the edges of the abdominal wound on each side. This prevents the intestine from falling back into the abdominal cavity or making traction on the suture. The surface of the intestine is attached to the edges of the circumference of the abdominal wound, throughout their entire extent, by means of the continuous suture applied so as only to take up its peritoneal and muscular coats. It can now be opened freely and the edges of the opening turned back and attached to the external wound by interrupted sutures; its contents can be washed out by irrigation and the usual dressings applied.

Some operators think it best not to open the bowel until after the lapse of several days has made the adhesions between the bowel and the abdominal wound absolutely secure. Other operators pursue the plan of shutting off that portion of the colon which is below the point of the formation of the artificial anus. If this operation is practiced, a portion of the colon is withdrawn from the external wound sufficient in length to freely expose its meso-colon; the contents are displaced from this exposed portion of the intestine, and kept out of the way entirely by including the upper part of the colon in a constricting band of one kind or another; the opening in the abdominal walls is then protected by sponges, or iodoform gauze pads applied between it and the bowel which is to be divided; the colon is then severed entirely and the meso-colon detached from the bowel for a proper distance; the bleeding vessels being permanently secured at once by ligation. The upper end of the lower portion of the divided intestine is then invaginated for a safe distance and permanently closed by means of the continuous suture, bringing its opposed peritoneal surfaces in close approximation with each other. After being thoroughly cleansed it is dropped into the peritoneal cavity.

The upper end of the divided colon is then brought into the external wound and accurately united to the edges of that wound by suture; the constricting band is removed, the peritoneal cavity thoroughly cleansed and closed by sutures.

INTESTINAL ANASTOMOSIS.

The following plan of making an anastomosis between different portions of the intestinal tube, has proven in my experience, eminently satisfactory and successful both in experimentation on the lower animals and in application to the human being. The contents of the folds of the intestine to be the seat of the anastomosis, are carefully displaced for some distance away and kept from interfering with the operation by the application of constricting bands firmly fastened about the tube, or by means of properly protected forceps. The opposed surfaces of the intestinal tube to be united are then fastened together for the distance of an inch by the continuous silk suture applied at some distance below the point at which the incision is to be made into the bowel. The incision is then made into the bowel, three-quarters of an inch in length, through that portion of the intestine which is directly opposite the mesenteric attachment to the bowel. A cross incision is made into the bowel one-half inch in length, at each end of the longitudinal incision; the middle of this cross incision being at the point of termination of the longitudinal incision. This procedure is carried out on both of the surfaces of the intestine which are to be applied to each other, making two flaps of the intestinal wall on each side, which can be folded into the lumen of each intestine and fastened by suture, thus forming a permanent opening between the cavities of the opposed folds of intestine, three-quarters of an inch long and half an inch wide. The lower edges of the wounds thus made are then sutured together with the same needle and thread which has already made the first line of attachment between the folds of intestine. While these sutures are being introduced the lower flaps of both openings are turned into the cavity of the corresponding intestine, thus allowing of the ready and accurate apposition of the peritoneal surfaces; they are carried through the surface of opposed intestine for some little distance below the lowest point of the opening into the bowel, fastening together peritoneal surfaces until the upper edge of the bowel is reached, when the intestinal flaps at that point are also turned into the cavity of their corresponding intestine and united by the same thread and in the same manner as in the lower edge, throughout their entire length. Finally, the opposed walls of the intestine above the opening in the bowel are united at some little distance beyond the opening, by means of the same continuous suture. Any seemingly weak points in the circumference of attachment are now secured by separate suture. The constricting band or forceps are removed, all foreign material cleared away, and the bowel returned into the abdominal cavity, the opening in which is closed in the usual manner. The intestinal flaps made in the way described, not only secure an immediate and permanent opening between the folds of the intestine united together, but also support and protect the applied surfaces of the intestinal walls. The entire procedure is executed with the same needle and thread, and can be carried out with great rapidity. The needle used is the fine, round English sewing needle, curved slightly towards its point; the best suture is very fine but strong silk.

In restoring the continuity of the alimentary tract after any operation which requires the removal of a portion of the small intestine, as well as of the large intestine, and necessitates the rejoining of these unequally sized parts of the alimentary tract, the following method is most satisfactory. The free ends of both the divided small and large intestine are invaginated into their respective tubes and permanently closed by bringing their peritoneal edges accurately together with the continuous suture, after which the small intestine is applied to the large intestine and a lateral anastomosis is established in the manner already described. This plan of forming an anastomosis is also safely applicable to the execution of the operation called gastro-enterostomy, or the establishment of a permanent fistula between the stomach and the small intestine. In the latter operation the external incision through the abdominal walls is made above the umbilicus over the neighborhood of the stomach, and its course may be either in the line of the linea alba or oblique in direction, and parallel with the edges of the costal cartilages, depending upon the choice of the operator.

It should not be forgotten, while contemplating the propriety of adopting or the success attending innovations upon established operations, that it is always proper to give due and just consideration to the older plans of operation; accordingly it is well to remember that the vast majority of wounds upon the small intestine, either produced by accident or design, have been repaired by the surgeon and the patients carried to recovery with the use only of the silk or catgut thread, practicing the well known method of a double row of sutures, advised by Prof. Czerny, of Heidelburg, and without the aid of any special apparatus or incision.

HYDATIDS.

Tumors developing in the abdomen as the result of the growth of the parasite termed echinococcus, require surgical operation for their relief. Many times the parasite can be killed and recovery ensue by a single aspiration of its serous contents; this result will usually follow only when the cyst is single and when suppuration has not occurred, provided the situation of the tumor is such as to allow of the introduction of the aspirator needle directly into the cavity of the cyst, without puncturing any other hollow organ or large vessel or excretory duct. Its success will depend on the complete emptying of the contents of the cyst. This method will fail, as it has in my hands, if the main cyst is full of loose daughter cysts which will be drawn into the needle and occlude its lumen. The danger attending aspiration is in not emptying the sac completely, so that the contents, subjected as they are to great pressure, are forced through even small openings like the needle puncture into the general peritoneal cavity, causing fatal peritonitis or inoculation of the parasite into the peritoneal cavity. Death has resulted while attempting to aspirate hydatid cysts from puncture of the hepatic veins, with sudden dissemination of the contents of the cyst into the general circulation through these channels; still many cases of perfect recovery from hydatid cysts are recorded as having followed a single aspiration of the contents. When the suppurative process has been established, open incision will be required. When laparotomy is necessary for the removal of the tumor thus formed, two operations are open for adoption; the first contemplates immediate incision of the sac and evacuation of the contents; the second proposes the performance of an operation for the purpose of establishing adhesions between the tumor and the abdominal walls, and after a lapse of sufficient length of time for their formation, to open the sac and empty out its contents. The first method of treatment is as follows: The tumor is exposed by an incision through the abdominal walls over its most prominent portion, made in accordance with the rules already given; if found non-adherent, the walls of the cyst are attached to the edges of the incision by the use of the continuous suture. The peritoneal cavity is closed entirely by means of the usual interrupted suture, introduced at such points as remain open after the attachment of the cyst to the external wound. The cyst is then opened freely and the contents evacuated and proper antiseptic dressings applied to prevent septic infection of this cavity, after satisfactory means of drainage have been introduced into the cyst cavity, either by the use of drainage tubes or strips of iodoform gauze. This method of primary incision is mainly applicable to cases in which adhesions have already formed between the cyst wall and the abdominal walls, or in those cases in which the cyst occupies a considerable portion of the abdominal cavity, displacing the contents thereof, and its walls thereby rather closely applied to the internal surface of the abdominal walls. It has been used safely in hydatids developing in the substance of the liver and still having at the time of the operation, a thin layer of liver tissue between the cyst and the abdominal walls. In such cases the external surface of the liver is attached to the edges of the external abdominal incision by means of sutures, previous to incising the cyst. After this incision is made, the treatment of the cavity is similar to that just suggested.

In the second method of operation, the proper incision is made through the abdominal walls to expose the surface of the cyst or the organ in which it is developed; the wound is then packed with iodoform gauze, covered with the usual external antiseptic dressing and left for several days. The presence of the packing in the wound soon leads to the establishment of firm adhesions between the surface of the cyst and the parietal peritoneum. When these are formed the dressings and packing are removed and the cyst cavity opened freely, emptied, drained and such external dressings used as have been described.

Firm adhesions will usually be found between the cyst and the abdominal walls if the suppurative process has occurred previous to the operation, and the latter is attended with correspondingly less danger. With pus present, free irrigation of the cavity of the cyst is indicated.

GASTROSTOMY.

Immediate starvation is avoided in a patient by the establishment of a permanent fistula between the stomach and the abdominal walls, and is practiced for the relief of otherwise irremediable stricture of the œsophagus as the result of the devel-ment therein of malignant disease or cicatricial contraction. The abdominal cavity is opened by an incision, three inches in length, carried through its walls, oblique in direction, parallel to the edges of the costal cartilages of the seventh, eighth and ninth ribs on the left side and three-fourths of an inch away from the costal margin. This opening being made, the middle portion of the anterior surface of the stomach is drawn well into it and attached to its edges by silk sutures. It is necessary to avoid entering the cavity of the stomach with the sutures passed through its walls. When this attachment is satisfactorily made the still open portions of the, abdominal incision are closed by sutures.

A silk suture is passed through the serous and muscular layer of the exposed portion of the stomach and left long to mark the position for the formation of the fistula.

If the patient's condition will allow, the fistula should not be made into the stomach until firm adhesions are formed between the stomach and the abdominal walls; at the end of 24 hours this will have occurred and the danger of peritonitis attending the entrance of the contents of the stomach into the peritoneal cavity avoided. If the patient's condition, from absence of food, will not allow of any delay being practiced, the opening into the stomach can be made at once, or milk can be injected into the stomach by the use of a hypodermic needle which is inserted through the portion exposed in the incision. This opening into the cavity of the stomach should always be small, sufficient to admit of the introduction of a No. 10 English catheter into the stomach cavity; if made larger than this there is likelihood of the occurrence of constant overflow of gastric juice producing annoying excoriation of the surrounding integument.

As soon as the fistula is well established the patient can be fed by means of a tube passed through it. In one case under my charge, a permanent tube, improvised from an aluminum tracheotomy tube, was used satisfactorily; the external opening was kept closed by a well fitting cork. The aluminum tracheotomy tube was shortened sufficiently and its free end worked into the shape of a flange, which, after the tube was introduced into the stomach, retained it in position; it was light and did not corrode. In cases of cicatricial stricture of the œsophagus dilatation can often be accomplished by carrying a bougie through the stricture from the opening in the stomach. After the stricture has been dilated sufficiently the opening in the stomach may be permitted to heal.

STENOSIS OF THE PYLORUS.

Impermeability of the pyloric extremity of the stomach as the result of cicatricial contractions or the development of malignant growth, has been relieved by means of three operations.

First, Loretta's operation for cicatricial stenosis, which is practically a divulsion or a forcible dilation of an inflammatory stricture of the pylorus. It is accomplished in the following manner: The stomach is exposed by an incision through the abdominal walls in the mid line, made after the usual manner and with the usual precautions. The anterior wall of the stomach is brought into the abdominal incision and opened to such an extent as will allow of the easy introduction of two fingers through this opening into ts cavity; the stricture is then dilated by passing the finger into it; first one and then two, followed by a separation of the two fingers in the stricture until the pyloric lumen is of satisfactory size. The wound in the stomach walls is then accurately closed by the Lembert suture, applied in two rows as recommended by Prof. Czerny; the first row introduced close to the incision in the stomach walls and the second row bringing peritoneal surfaces together, at least one-fourth of an inch away from this incision. The abdominal wound is closed by sutures and proper dressings applied.

It should always be borne in mind that in all operations in the abdominal cavity in which the stomach is opened, if the œsophagus is patulous, it is imperatively necessary to wash out the stomach repeatedly with some mild antiseptic fluid such as one-half per cent. solution of table salt, in order that contact with any of the deleterious contents of the viscus may not imperil the success of the operation.

Second, free vertical division of the stricture and pylorus, with subsequent transverse suturing of the wound thus made.

In this operation the pyloric extremity of the stomach is exposed to view by means of the usual incision through the abdominal walls and the pylorus drawn well out of the wound; the vertical incision is then made over the center of the pylorus, opposite to its attached margin; it should be sufficiently long to divide the entire length of the contracted portion; the centers of the opposite edges of the incision are then seized with proper forceps and drawn away from each other until the wound through the pylorus is made to assume a transverse direction, in which position the edges are accurately united by sutures and the pylorus is returned to the abdominal cavity, the external wound closed and proper dressings applied.

When the pylorus is the seat of a malignant growth, *Pylorectomy*, or complete excision of the tumor is practiced for its relief. The tumor in the pylorus is exposed by the usual abdominal incision, made either in the mid line or over the course of the tumor. When the tumor is exposed, it is sufficiently freed by a separation of adhesions or attachments, to be brought well through or into the abdominal opening. The cavity of the abdomen is protected from the entrance of deleterious material, during the excision of the mass, by the proper application of sponges or other material around and beneath the exposed tumor. The detachment of the tumor is made by a division through the stomach walls and duodenum, through healthy tissue; the necessary incisions are made slowly and carefully. All bleeding vessels in the walls of the viscera, or their mesenteric attachments, are permanently closed by ligature as soon as divided. After the removal of the tumor the large opening in the stomach is diminished to correspond in size with the lumen of the duodenum, by closely approximating the edges of the opening in the stomach by means of silk suture. The continuity of the alimentary tract is then restored by attaching the free extremity of the duodenum to the properly reduced opening in the stomach, by means of a double row of silk sutures; the first row applied close to the edge of the opposed openings and carried around the entire circumference of the intestinal tube; the second row applied at least one-fourth of an inch away from the first row, and also encircling the intestinal tube. If the interrupted suture is used, they should not be introduced at a greater distance than one-fourth of an inch apart. The abdominal cavity is thoroughly cleaned and the external opening closed with sutures and dry external antiseptic dressings used. Gastro enterostomy is rather more satisfactory and less dangerous than pylorectomy and is usually practiced in preference.

Super-pubic Cystotomy.

The bladder is rendered as nearly aseptic as possible by repeated irrigation with 3 per cent. solution of boric acid in water and the administration of 5 grains of boric acid internally every four hours for a few days preceding the operation.

The incision for exposing the bladder above the pubis should be three inches in length and made accurately in the mid line, there is usually no difficulty in following this line as the pyramidalis muscles form an easy guide to be followed; the deeper portion of the incision should reach the pubis at its lower end as it is carried down to the transversalis fascia. All bleeding vessels are secured. If possible the bladder is distended by forcing into its cavity ten or twelve ounces of a four per cent. solution of boric acid in water. This distention of the bladder brings its fundus well above the pubis and as a rule the reflection of the peritoneum above the external incision. As soon as the external incision has reached the fascia covering over the anterior wall of the distended bladder, this fascia, together with the peritoneum, is pushed up to the extreme upper end of the external incision by the index finger of the left hand. The anterior wall of the bladder is then fully exposed to view by dividing the fascia covering it. The anterior bladder wall having been uncovered, a curved needle armed with a silk ligature is introduced through its walls on each side, opposite to the middle of the external incision. The needle used for this purpose should take up half an inch of the bladder wall; these sutures are cut long and their ends tied together and are used for the purpose of controlling the bladder walls and the incision made into this cavity; they should be handled carefully to avoid tearing the bladder tissue included in them. The incision through the bladder walls into its cavity, is made by thrusting a knife into that cavity through them, with the back of the knife turned upwards; the incision is extended downwards as far as is necessary to accomplish the purposes of the operation, and this length will depend upon the size of the calculus which is to be removed or the tumor to be treated and which size has been somewhat accurately estimated before the operation is begun.

As soon as the opening into the bladder is made the water which distended it will rapidly flow away; the edges of the incision in its walls can then be held up into the external opening by means of the stay stitches already introduced, and thus avoid losing the opening into the bladder or the greater danger of undue separation of the investing tissues of the bladder by unnecessary manipulation. Any foreign body present can be removed by the fingers or forceps introduced into the cavity of the bladder.

If the operation is done for the treatment of tumors or other diseases requiring its performance, the necessary manipulations can be executed through this opening in the bladder.

The next procedure depends upon whether the patient's urine has been shown by previous examination of it, to be healthy and inoffensive in character or foul and deleterious in nature from the presence of cystitis. If the urine is healthy and the urethra normal in size, the wound in the bladder is closed immediately by bringing its edges in accurate apposition by means of closely applied interrupted sutures; this can easily be accomplished even in the presence of thick abdominal walls, as the stay stitches will enable the operator to hold the wound in the bladder under perfect control. The external wound is then accurately closed after the removal of the stay stitches, with the exception of its lower end, at which a rubber drainage tube is introduced to the bottom of the cavity. The drainage tube is left in position for two days, to provide against the accident of leakage through the bladder wound; if no leakage occurs at the end of that time and the urine is passed normally, it can be withdrawn. Dry antiseptic dressings are applied to the external wound.

When cystitis is present in the case and the urine thus rendered foul and offensive, it is best not to make any attempt to close the bladder wound; after accomplishing the purpose for which the operation was undertaken, through the incision in the bladder walls, its cavity is thoroughly irrigated with some mild antiseptic solution and a fair sized drainage tube, properly perforated, introduced well into its cavity and brought out of the lower end of the abdominal opening. Perhaps it is better to introduce two drainage tubes of moderate size into the cavity of the bladder, one of them being perforated, the better to provide for future irrigation of the viscus. The stay stitches are then removed and proper external antiseptic dressings applied.

Many plans are in use to successfully overcome the annoyance attending the overflow of urine in such cases as must be left open. No plan, in my experience, has answered so well as the application of masses of cheese cloth, moderately moistened with a two per cent. solution of carbolic acid. These moist pads absorb the urine and when changed often enough the patient can be kept quite dry.

It has not been my experience during the performance of quite a number of super-pubic cystotomies to meet with hemorrhage of any consequence following the division of the blood vessels coursing through the fatty tissue investing the anterior surface of the bladder. It is my belief that their importance and the danger attending their division has been greatly magnified. On several occasions after the usual external incision was made, the bladder was safely reached and successfully opened by myself, when undistended, and without the introduction of the sound as a guide, by separating the tissues covering the bladder close behind the pubis with the finger, until its anterior wall was uncovered well down on that surface; holding the finger in contact with the uncovered bladder wall the knife is introduced along the finger as a guide, and the thrust made which opens its cavity.

When the urethra is patulous a sound can be introduced into the bladder and the anterior wall lifted on the point of it into the external opening, after which the necessary incision into the bladder cavity can be made on to the projecting point of the sound after the introduction of the stay stitches, the use of which has been recommended.

Splenectomy, or complete extirpation of the spleen for enlargement, the result of the disease termed leucocythemia, is attended with such an overwhelming mortality, that its performance can scarcely be justified. For one reason or another, the surgeon is tempted to perform splenectomy with the hope of giving relief in these lamentable cases. This should be done only for conditions not complicated with leucocythemia.

The incision through the abdominal walls to uncover the tumor should be made in the left lines semi-lunaris, and should be made long enough to make subsequent manipulations easy. If free from adhesions and the organ has a sufficiently long pedicle to allow of its ready extraction through the abdominal incision, this pedicle, made up of blood vessels and peritoneum, is carefully bisected, ligated in halves and divided, after the pedicle is secured for subsequent inspection by the application of a pair of forceps outside of the ligature. If many adhesions are present to the diaphragm or other organs, their separation is attended with great loss of blood, even if the vessels separated are not large, because the condition of the blood in these cases is such as not to be accompanied with the phenomena of coagulation. The majority of such cases die from hemorrhage very shortly after the removal of the tumor.

Cysts of the spleen are more amenable to relief, their removal being attended with the subsequent restoration of the patient to health. The incision to uncover these is the lateral one mentioned. Their complete removal, even if attended with that of the unenlarged spleen, has shown favorable results.

If the cyst is in such condition as to preclude its entire extirpation, it should be attached to the incision in the abdominal wall, incised, emptied and treated as already directed for the care of an irremovable cyst of any abdominal organ. In all conditions the external incision is managed according to the rules already given.

The vessels entering the spleen are normally very large and are increased enormously in size in many of these tumors under consideration, so that the utmost care must be practiced in the means used in the control and prevention of bleeding from them.

Fifty Successive Cases of Ovariotomy.*

In presenting for your consideration a tabulated list of my first fifty cases of operation done in succession for ovarian tumor, it will be my object to call attention to those only which seem to me to possess somewhat special characteristics, or have shown something unusual in their course. Not but what I believe that every case is of special interest to the operator, in so far as it furnishes him individually with useful experience and something new to cogitate over, and from which to elucidate improvements in future cases coming under his care. To mention all these circumstances would become monotonous.

In the final summing up I shall attempt to group together, in a somewhat practical way, the deductions which come to my mind as the outgrowth of this amount of work.

My work in this field commenced rather early in my professional career, and whatever success may have attended my efforts could not have been, and was not, the outcome of any special preparation. The first half-dozen operations were done before ever having witnessed the operation performed by any other operator.

In 1878 it was my privilege to see considerable of this kind of work executed by the attendants at the Samaritan Hospital, London, and other surgeons.

Since then, I have felt more at my ease in this labor, and could speak more emphatically as well as encouragingly to my patients. Before then the work had associated with it a large expenditure of force, both mental and physical, on the part of the operator, and I am free to admit that, as a rule. the patients did not get along as easily and smoothly as they have since. Still it has been my good luck not to have a very large percentage of mortality. The table shows that the second and thirty-seventh cases died as the result of circumstances attending the operation. Two out of fifty—it is not a bad showing. If it is my good fortune to equal this percentage in the second fifty, no complaints will be heard from me.

Case I.—This lady is still living in this city. She has never borne any children. The operation was done during the third year after my graduation, and is chosen for remark, first, because the case furnishes a good illustration of the impudence and assumption sometimes displayed by young and ambitious practitioners, and which causes them at times to run where angels would fear to step even slowly. I believe I invited to be present at the operation Professors Freer, Gunn and Powell, Jackson, Bogue, and some others, and they were all on hand. It has always been a mystery to me how that operation was carried on, or finished; perhaps some who were present might be able to tell; it is impossible for me to do so. However, it is clear in my mind that there was no encouragement to me in their prognostications as to the result. They were unanimous in the assertion that the issue would be fatal. But it was not, although the patient had a hard time of it for awhile. Secondly, the case is of interest in the condition which made her recovery slow and full of hazard. The fourth or fifth day showed evidences of profound septic infection. An abscess was at last discovered in the cul-de-sac of Douglas. After opening and washing it out and draining thoroughly, she passed on rapidly to a full recovery. This latter inflammation may have so changed the remaining tube or ovary as to account for the subsequent sterility. No antiseptic precautions were adopted in this case.

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* Read before the Gynæcological Society of Chicago, Friday, April 20, 1888.

Case II.—This case was one of double ovarian tumor. The right cyst was free, non-adherent, and easily removed. The left was universally adherent to the left side of the abdomen, to the small intestines, spleen and stomach. Its contents were so gelatinous that they were scooped out with the hands, and the cyst-wall was so thin that it broke down in many places during these manipulations, allowing the contents to become disseminated about and around the abdominal organs. The oozing was very free from the extensive surfaces of adhesions, and there was used a solution of persulphate of iron to check it. This remedy is a very unpleasant one to employ; this was the first and last case in which I have made use of it. The abdomen was washed and cleaned, as I thought, thoroughly.

A large sized rubber drain was carried to the bottom of Douglas' cul-de-sac. The outer end of it was connected with a long rubber tube, carried outside of the bed and beneath it, and submerged in a solution of carbolic acid. The patient died on the third day of acute septicemia. The drain, carried to the bottom of the receptacle, gave exit to about two ounces of the contents of the cyst. It is fair to think that this case could be managed better to-day. No special antiseptic measures were adopted.

Case IX.—This case was the first tumor with purely colloid contents which I had come across. It was with the utmost difficulty that its contents could be emptied out of the rather small incision which exposed the tumor. Still by persevering effort, it was all dug out, and, as few and recent adhesions only were found, the empty sac was pressed out and rather easily removed. I have seen such cases treated by enlarging the abdominal incision in order to turn the mass out entirely. It has struck me that this method was not as good as emptying the cyst through the small incision. As all the cases turned out *en masse* have died, that fact may have influenced the formation of the opinion expressed. The cause of death may have been something else.

Case XXVI.—This case was [the youngest person upon whom I have operated. Owing to the great size of the tumor, as compared with the size of the body, she presented a very odd appearance.

In order to maintain an equlibrium while in the erect position, the shoulders were thrown far back—a plumb thrown from the shoulders touched the floor six inches behind the heels.

The tumor was a dry one, and before it could be extruded the abdominal incision was prolonged above the umbilicus. For such a massive tumor the pedicle was very small as well as elongated. The weight of the tumor was fourteen pounds. The case was to me, particularly interesting because it was the only one of the series in which any attempt was made to carry out *in full* all the details of a Listerian operation, including the spray. Notwithstanding all this an abscess formed in the left iliac fossa, which delayed the recovery for weeks and placed her life in great danger, especially as, even after it was opened externally, it seemed to empty internally into the bladder; large quantities of pus were passed from that viscus.

At the end of six weeks she had entirely recovered. This was the only case in which I have been haunted with the fear that I might have left some foreign body in the abdominal cavity, such as a sponge or a pair of forceps.

The sequelæ showed it to be a groundless fear, fortunately. The subsequent history of this case is also interesting.

At the end of two years she again came under my care with the abdomen distended with a large growth.

This secondary growth commenced in the upper zone of the cavity, and in its development increased downward. It was diagnosed to be post-peritoneal, on account of the crackling which could be produced by manipulation in circumscribed spots over the surface of the tumor. The noise was evidently produced by the displacement of intestinal gases over limited spaces.

Upon opening the abdomen the mass was found entirely behind the peritoneum, which was opened posterially and the tumor easily enucleated. As far as could be determined, the mass grew from the lesser end of the pancreas.

She did not survive the shock of the operation but a few hours. The mass proved to be sarcomatous. A post-mortem examination showed no traces of even the stump of the first tumor.

Dr. Fenger was present at the first operation and pronounced the tumor to be a heterologous growth.

With an entire absence of any remnants or signs of the primary tumor, it seems rather difficult to trace any connection between it and the secondary manifestation.

Case XXXV.—This was a case of double papillomatous ovarian cyst, in which the tumors had become intimately adherent, filled up the pelvis entirely, so as to absolutely conceal the womb and bladder. The cysts had ruptured so that in themselves they were small. The abdomen was distended with an immense quantity of free fluid. They were freely enucleated from their bed and from the surface of the uterus and bladder and removed. There was left as the result of this extensive peeling a surface coequal in size with the capacity of the pelvic basin. After securing the pedicles and a few spurting arteries, the bleeding was easily stanched and showed no disposition to return after the introduction of a large drainage tube to the bottom of the cavity and closing of the abdomen. I have never seen a larger flow of serum from a drainage tube than followed in this case for several days. Fortunately, no infection of the general peritoneal surface had occurred, so that the lady recovered very rapidly and is well and strong to-day. The free drainage in this case, I have no doubt, contributed very greatly to the easy recovery. Without it I believe the patient would have been suffocated by accumulation of serum; certainly no powers of elimination could have removed the amount of fluid drained.

Case XXXVII.—This case was certainly the worst I ever met with so far as extent and firmness of adhesions go. It was universally adherent to the abdominal walls, the small intestines, the bladder, the uterus, the under surface of the liver, and to the stomach. In fact, at only one place was a space as large as the surface of the hand untrammeled by adhesions. This was around and about the pedicle. After separating the attachments to the abdominal walls down to this space on the right side, the pedicle was ligated and divided. It seemed impossible to reach the limits of the tumor from the anterior surface upward, so after securing the pedicle the sac was turned upward, and the separation of the adhesions carried on from behind. It was a very slow and tedious piece of work, separating coil after coil of small intestine. When the stomach was reached, the adhesions were found so firm and extensive that it was deemed best to leave a large piece of the external layer of the sac wall attached thereto, rather than to try to separate them. This was accordingly done. All of the tumor except the piece left on the stomach was finally removed. There was not an excessive amount of bleeding, and the abdominal cavity was readily cleansed and a drain put in.

The operation was done in Nebraska, and I had to leave the patient within two hours after the operation was finished. She was then in good condition. She died on the sixth day, as the doctor in charge wrote me, with all the symptoms of unrelieved obstruction of the bowels. Perhaps if the abdomen had been reopened early in the manifestations of these symptoms, the obstruction might have been overcome, but this can only be a supposition. this was the second and last death in the series of fifty cases.

Case XXXVIII.—The tumor in this case was accidentally discovered while operating upon a growth developed in the abdominal walls over the neighborhood of the gall bladder, and from which there was removed a gall stone of considerable size. Some months after the recovery from this operation, laparotomy was done for the small tumors which filled the pelvis and were developed from both ovaries—the right one much larger than the left, but both small. They proved to be ruptured cysts, showing papillomatous degeneration. Some six weeks after this operation, after the wound had united well and recovery seemed established, she developed increasing symptoms of bowel obstruction. Examination of the rectum revealed a cancerous mass at the upper end of the rectum, probably also involving the sigmoid flexure. She was anæsthetized and the narrowed channel well dilated, sufficiently at least to relieve the accumulated contents. Still, the patient gradually emaciated, and at the end of a week or ten days succumbed to the effects of the complication.

Case XLI is only remarkable from the age of the patient—78 years old—and the perfectly uneventful recovery after the operation. Looking back at the case, I remember the impression made upon me at the time was that she was the most contented patient ever under my care.

No anxiety or worry of any kind was manifested. Everything done was good enough for her and gracefully accepted. The querulousness and disposition to be exacting sometimes supposed to go with old age was never displayed. I am quite sure her peaceful disposition had much to do with her speedy and happy recovery. I have since operated on a lady 68 years old for an ovarian cyst, and the results were nearly alike. So far as these two cases are of account, nothing whatever occurred that would make quite old age militate against the performance of the operation. The shock did not seem so great as in many other easier cases in younger patients, and the reaction was quite as prompt and harmless.

The case under consideration was a large multilocular cyst with thick walls and septa. The previous tappings had not apparently left any unfavorable conditions in their wake. The adhesion present gave no noticeable trouble.

Case XLII.—This was my first case of twisted pedicle. The inflammatory symptoms—peritonitis—high fever, and extreme prostration had existed several days before the patient came under my care. Operation was advised and done immediately. The bad symptoms subsided at once, and the recovery was uneventful.

There followed in due course quite a large ventral hernia, although primary union occurred in the wound, at least in the skin.

It is possible that the usual care in picking up surely each layer of the abdominal wall was not followed in closing the incision, but I was not aware of leaving anything undone in that respect at the time of the operation. The diagnosis of twisted pedicle was based upon the previous existence of the tumor, its sudden and rather rapid enlargement, extreme tenderness of the tumor. followed by the usual symptons of peritonitis and constitutional manifestations of early and severe character. There was present also a free flow of dark blood from the uterus, commencing with the first symptoms and persisting.

Case XLV was the second tumor removed having very thick colloid contents. It was perfectly symmetrical and free from adhesions of any importance.

The contents were extremely tenacious, and their removal to diminish the size of the cyst was attended with extreme difficulty. The cyst was held very carefully against the edges of the abdominal incision during these efforts, in order to avoid the entrance of any of the stuff into the peritoneal cavity. It is much easier to keep it out entirely than it is to get it out after it has once gained admission into the cavity. On two occasions the leaving of a very little of this material in the cavity inadvertently has given rise to serious complications in my experience.

Case LX.—This case was also one of twisted pedicle; the symptoms of rapid increase in size, tenderness, and uterine hemorrhage coming on suddenly and persisting, with developing peritonitis, were plainly present in the case, and early operation advised. Consent to operate was not obtained readily, and when the incision was made the cyst and pedicle were found black.

Ulceration between the living and dead portion of the pedicle had well advanced at the site of the twist lowest down on the pedicle. Its complete separation was unattended with hemorrhage. The case did well from the very first day.

Remarks.

It has always been my aim to do every one of the operations here recorded with closer and closer attention to absolute cleanliness of person, assistants, patient, and of appliances.

As time passed along more experience gained, and complicating difficulties traced to their cause, after suffering manifold mental worry over them, this aim has been better and more certainly attained, with a corresponding increase in confidence in myself and ability to make assurances to the patient with an abiding faith in their fulfillment.

There is no doubt in my mind whatever about the good done a patient by relieving her mind of doubts and nervous dread preceding the operation, as can be done by confident assertion. The success attained in ovariotomy of late years warrants an indulgence in very strong assurances on the side of recovery in all classes of cases.

The attempts to secure asepsis—to surely save one's patient from the dangers of fermentation, suppuration, and decomposition of wound secretions—brooks no neglect of any kind in the items already mentioned. It is not a pleasant thought to be forced to the conviction that you have rewarded the confidence and faith reposed in you by carrying to the afflicted one the elements which, once developed, so often destroy life, especially if the misfortune be the result of carelessness or over confidence. So nothing that is used or brought in contact with the patient should be allowed to pass without the closest inspection by the operator himself. The patient puts her life in the operator's hands, not in those of an assistant, and is entitled to the former's own care and attention to the smallest detail in the preparation of needles, forceps, and instruments of all kinds, ligatures, sponges, and dressings. It is my conviction that sponges should not be used the second time in abdominal operations, no matter how well they are cleaned. They are so difficult to free absolutely from the contamination of blood and secretions, that one can scarcely be sure of them. Besides, the operation is so well paid for in most instances, and the material so cheap, that there seems no excuse to run any danger whatever.

The greatest diligence should be observed in keeping everything harmful out of the peritoneal cavity. Reference is made not so much to foreign bodies of large or small size, although such ought never to occur, as to the escape of the contents of the cyst into the cavity. To me it has always been a very difficult undertaking to clear out any such secretions, especially if they are from a cyst with sticky contents. In two cases I worked for fully an hour in my desire to be sure that all particles had been removed, and yet in both cases an abscess subsequently formed, accompanied with a formidable temperature and general exhaustion. These accumulations were fortunately found and opened. Their contents showed more or less of the same material that filled the cyst, and the trouble was evidently dependent upon its presence in the cavity. The stuff will not flow through a drain easily, so that I am not sure its use would have overcome the difficulty.

The contents can usually be kept out of the peritoneal sac by making the cyst constantly expand the edges of the abdominal incision during the necessary manipulations, by careful pressure against the tumor by an assistant.

The ligatures used have always been of carbolized silk, and they have never given rise to any trouble. In the greatest number of cases the pedicle has been clamped, the tumor removed, and the stump thoroughly cauterized down even with the clamp. Then the pedicle was sufficiently subdivided just below the clamp and ligated with silk, after which the clamp was removed and the stump dropped. I have never had, following this method, any bleeding, or been called upon to reapply the ligature, or fish up a stump out of the pelvis after it had been dropped, to stay hemorrhage. It is the method used by Dr. Homan, of Boston.

Accidents such as indicated have happened to me when using other methods, and I have seen them occur in the hands of other operators.

Perhaps I may be pardoned for uttering a warning against using the ends of a ligature just tied for the purpose of bringing the tied tissue into view for inspection, especially against using them to in any way steady or lift the pedicle. This latter should always be fixed and manipulated with a pair of forceps fixed to its edge below the site of ligation. On more than one occasion traction on the ligature, apparently slight, has destroyed its compression and induced bleeding, or even torn it entirely loose, necessitating a tedious search for the lost stump in order to re-tie it; and one never feels as certain of the security against hemorrhage after such an accident, aside from the delay and annoyance caused.

My experience confirms the great worth of, and necessity for, the drainage tube in many cases. Cases with many vascular adhesions leaving extensive oozing surfaces seem to always require the drain. Many cases would undoubtedly do better with it, even in which the raw surface is not large. One is more apt to err on the side of leaving it out than of making use of it too frequently. It takes but little over-weight of absorption and elimination of even not badly contaminated fluids to upset a patient's easy recovery, which might have all been obviated by the use of a drain for twenty-four or forty-eight hours. I have not noticed much difference in its workings, whether it be of glass or rubber; I have used both and the object aimed at was accomplished by either equally well.

The abdominal wound has always been closed with the silk suture passed carefully and carried through the different layers of the abdominal walls, including the peritoneum. It does not seem that any more satisfactory method has been advanced. It is quickly executed and absolutely trustworthy in the vast majority of cases. Two of my cases have had ventral hernia follow; but I am inclined to think other things had something to do with the occurrence of the complication, such as too early assumption of the erect position, too free motion, and discarding the abdominal support too soon. Very few of the cases have shown any suppuration in the track of the sutures, or other complication in the line of the incision; certainly no more than six gave any trouble whatever. In very thick, fat walls, the use of three or four button-stay sutures, introduced well away from the edges of the incision, is of great advantage in maintaining the parts in close apposition and conducing to early and firm union.

In the after-treatment of the earlier cases it was the rule to use the catheter to empty the bladder six hours after operating. Quite a number of the cases developed a troublesome cystitis, and in some cases a urethritis, no matter what care was taken with the instrument or in its introduction. Of late it is not used unless absolutely required. The patient is induced to make earnest efforts at self-relief, and success generally follows these efforts, and cystitis has ceased to be a complication.

It has become my habit not to feel concerned about a temperature up to 101 degrees Fahr., coming during the first three or four days after an operation, if it be unaccompanied with unusual pain, headache, or anorexia. By securing a free action from the bowels by the administration of 5 grains of hydrarg., submur., followed in due time by some saline cathartic, and urging the patient to partake freely of water, the temperature ordinarily drops to about normal in twenty-four hours. If, with a nearly normal temperature for several days after operation, it suddenly mounts to 100 degrees or more, some complication is impending, and it must be sought for with great care. Laterally it has been a surprise to me how many of the cases go on to a safe recovery without the administration of any medicine. If sepsis is avoided, the individual's own powers of repair seem entirely competent to combat other complications with the simplest of assistance. When pain is a complication, rectal injection of the tr. opii deodorata, in full, free doses (30 drops or more), has always seemed to cause the least disturbance and accomplish the best results.

In none of these cases did there arise any necessity for reopening the abdominal wound,

Tne highest temperature recorded occurred in the twenty-sixth case, in which 104 degrees was present for several days. The abscess was found and opened and the girl got well. Cases one and nine, forty-five and forty-seven, also had abscess collections, with high temperatures. The collections of septic matter were opened where developed, and the cases finally recovered; but the complication entailed upon them a slow recovery and a weakened general condition which those escape who pass through their ordeal free from such complication.

Both with these serious conditions and other slighter ailments, less severe but absent entirely in perfectly aseptic cases, the fault must be laid upon my own shoulders. At first, lack of experience, then want of attention to detail in appliances or surroundings, and finally, perhaps, over self-confidence. It is my belief that he will have the best success who is modest enough to be haunted by some doubts about himself, and so to be ever on the watch to prevent the entrance of harm from without.

The internal remedies from which the best results have been obtained for the relief of tympanitis are the spts. terebinthina and tr. nux vomica; the former to allay gaseous fermentation and as an antiseptic; the latter acting probably as a stimulant to intestinal peristalsis. It has never seemed to me that much of any good was accomplished by the rectal tube. It is not my wish to advise against its use, for many operators believe in its efficiency and use it constantly. It is quite possible that I do not use it skillfully. However that may be, I do not remember to have gained much if any good by its use. Cases in which the introduction of the rectal tube released any amount of gas could always relieve themselves by exercising a little will power, partially that of relaxation of the sphincter, mainly that of contraction of the abdominal walls. It has seemed to me that its presence in the rectum, if left there, as is practiced by some, might be of service as a foreign body in exciting peristalsis. Tympanitis, like so many other complications when they come, is usually the result of septic infection, and is best dealt with by keeping the germs away from the patient before, during, and after the operation.

The fluid I am in the habit of using for purposes of washing or irrigation is plain distilled or boiled water, with the addition of a small quantity of carbolic acid, making a solution of a strength of about two per cent. It does not seem certain that the germicidal power of this solution is of much consequence, still it does not seem worth while to dispense with it entirely. In washing out the peritoneal cavity, if occasion requires, a strong solution of boracic acid is used, and has done its work harmlessly and satisfactorily. Of course, reference is made here entirely to ovarian tumors, pure and simple. Infected cases with pus present and other harmful fluids, require more powerful antiseptics and assiduous care in getting rid of their presence by every known means.

The fifth and thirty-fifth cases of this series showed papillomatous degeneration and rupture of the cyst wall, with the presence of extensive accumulation of ascitic fluid, rendering the diagnosis extremely uncertain. I have operated on several cases since, and they have all been difficult to diagnose and to handle. Fortunately, these two presented no secondary infection of the peritoneum, and they recovered.

The diagnosis must be made by a process of exclusion.

Heart dropsy, by the absence of facial œdema and heart lesions; kidney dropsy, by the absence of leg œdema and the signs of kidney degeneration as shown by the microscope; ascites, from liver or vessel obstruction, by absence of the manifestations of disease of those organs, as shown by careful physical examination and inquiry as to their usual constitutional manifestations.

Digital examination in all the cases seen by me has demonstrated the presence of a somewhat circumscribed mass in the pelvis, from which the uterus could be isolated. The feel of the mass itself gives one the sensation of touching an irregular, doughy, cauliflower-like tumor. The differential diagnosis from tubercular peritonitis with ascites will be, in the absence of the tumor from the pelvis and the presence of a greater or less number of irregular, hard, perhaps movable masses distributed through the cavity, showing involvement of the omentum.

Differential diagnosis of cancer will be probably in the fact that the latter shows less ascitic accumulation, a more easily defined mass, much harder to the touch. Examined through the pelvis, every tissue is apt to show infiltration; the uterus is fixed and implicated in the growth; the roof of the pelvis everywhere hard and resisting. There will more likely be evidence of interference with the circulation of one limb, as shown by œdema confined to one side. Enlarged and tortuous external abdominal veins, and more rapid and profound constitutional manifestations will be present. Even after rupture of the sac, and moderate infection of the peritoneum, these cases seem to do perfectly well after operation and removal.

It seems to be of paramount importance to institute such care of the patient as will most surely prevent, diminish, or overcome the occurrence of shock. After every severe operation, much can be done by the use of external warmth, and also care during the progress, by keeping wet clothes away from the body. I am still convinced of the efficacy of morphia and quinia administered half an hour or so previous to the commencement of an operation.

It can scarcely be denied that the patients do best if little, or better still, nothing, is put into the stomach for twenty-four hours or more. If introduced, the effect is merely to increase the disposition to vomit.

Judging from the results of considerably over one hundred laparotomies for different diseases, I think it proper to say that, as a rule, an operation for the relief of a simple ovarian tumor is about the simplest proceeding the surgeon is called upon to do in the abdominal cavity, and one from which the patient is most likely to recover.

Professor C. T. Parkes in closing the discussion, said: There is very little to say, except, perhaps, in reference to what was said about the simplicity of the operation. I tried to make it plain that in reference to many other operations that are done in the abdominal cavity it is simple, not in reference to all operations. Surgeons in all parts of the country are doing ovariotomy, and the result is favorable in most of these cases. It must be a simple operation, or the results would not be so favorable.

No. of Operation.	Date.	Name.	Age.	Kind of Tumor.	Which Ovary.	Catamenia Since.	Children Before.	Children Since.	Married or Single.	Health Since.	Incision.
1	Sept., '71	Hughes........	23	Multiloc.........	R	No	No	No	M	Good	S
2	" '71	Forberger......	35	Mul. colloid.....	R & L	......	Yes	......	M	Died	L
3	" '73	Winchell.......	49	Mul. cyst........	L	No	No	......	M	Good Died 1880	S
4	" '73	Peters..........	37	Broad lig. cyst...	R	Yes	No	......	M	In 1881 good	S
5	" '73	O'Mally........	45	D'ble. papilloma	R & L	No	Yes	No	M	Good Died 1884	L
6	" '73	Carney.........	44	Unilocular.......	R	No	Yes	No	M	Good Died 1878	S
7	April, '73	McGovern......	33	Multiloc.........	L	Yes	No	Yes	M	Good	S
8	" '74	Hunt	39	Unilocular.......	L	......	Yes	......	M	Good	S
9	" '74	Edwards.......	41	Colloid tumor...	R	Yes	No	No	M	Good	L
10	" '75	Foster.........	52	Multiloc..........	R	No	7	No	M	Heard 3 years after, fair	S
11	May, '75	Martin.........	57	Broad lig........	L	Yes	No	......	M	Don't know	S
12	Sept., '75	McNulty.......	28	Multiloc..........	L	Yes	No	......	M	Good	S
13	Dec., '75	Jones..........	48	Multiloc cyst....	L	......	5	......	M	5 years after, fair	S
14	" '75	Hunter	55	Multiloc cyst....	R	No	2	No	M	Fair Died 1876	S
15	Jan., '79	Hedrick	62	Multiloc cyst....	L	No	3	No	M	Fair 3 years after	S
16	" '79	Phillips........	36	Multiloc cyst....	L	Yes	No	No	M	Poor	L
17	Mar., '79	Henderson	29	Uniloc. cyst.....	L	......	No	......	M	Good	S
18	" '79	Pollock.........	31	Multiloc cyst, colloid.	R	......	......	......	M	Fair	L
19	June, '79	Probiski	25	Multiloc cyst, Unilocular cyst	R	Yes	......	......	M	Fair	S
20	" '79	Healy..........	18	Parovarian cyst..	L	Yes	......	1	S	Good	S
21	" '79	Dayton........	36	Dermoid cyst....	R	Yes	2	No	M	Fair	S
22	Nov., '79	Johnson	43	Parovarian cyst..	L	......	No	No	M	Good 5 years ago	S
23	" '79	Jones	23	Multiloc cyst....	R	Yes	No	No	S	Good	S
24	" '79	Mason.........	65	Multiloc cyst....	L	No	3	No	M	Died 2 years after, Fair to death	S

Rupture.	Ligatures Heard From.	Twisted Pedicle.	Weight.	Drainage.	Adhesion.	Pedicle, Kind and How Treated.	Result.	Remarks.
No	Yes	No	27 lbs	No	Yes	Transfixed: ligated.	R	Ligature discharged through abscess in cul-de-sac of Douglas two weeks subsequent.
No	......	No	43 "	Yes	Yes	Long pedicle; transfixed and ligated,	D	Left very large; right small and single. Tapped once, previously.
No	No	No	34 "	No	Yes	Moderate pedicle; transfixed and ligated; silk.	R	Right ovary also removed; cystic degeneration. Tapped twice.
No	No	No	22 "	No	Yes	(Enucleated), ligated; silk.	R	Cæcum and colon carried upon wall of tumor some distance.
Yes	No	No	42 "	Yes	Yes	Short; transfixed, clamped, cauterized, and ligated.	R	Cyst small. Free fluid.
No	No	No	26 "	No	No	Fair; transfixed and ligated.	R	Contents milk-white.
No	No	No	21 "	No	Yes	Long; transfixed and ligated.	R	
No	No	No	33 "	No	No	Long and slender; transfixed and ligated.	R	Thick walls; chocolate-colored fluid.
No	No	No	32 "	No	Yes	Broad; short four sections; clamped; cautery; ligated.	R	
No	No	No	24 "	No	Yes	Short and broad; transfixed, ligated, and cauterized.	R	
No	No	No	28 "	No	No	Transfixed and ligated.	R	Enucleated.
No	No	No	......	No	Yes	Ligated in many sections and divided.	R	Also removed mass of omentum.
No	No	No	22 "	No	Yes	Thick; transfixed and ligated.	R	No answer to letter.
No	No	No	25 "	No	Slight	Short and thick; transfixed. ligated and cauterized.	R	
No	No	No	18 "	No	No	Moderate; transfixed, ligated and cauterized.	R	
No	No	No	39 "	Yes	Yes	Broad; short and thick, transfixed, ligated and cauterized.	R	Semi-solid contents.
No	No	No	18 "	No	No	Moderate; transfixed and ligated.	R	
No	No	No	23 "	No	Yes	Medium; transfixed, ligated and cauterized.	R	
No	No	No	38 "	No	Yes	Fair; long and broad: transfixed, ligated and cauterized.	R	
No	No	No	23 "	No	No	Short and broad; ligated in four sections.	R	
No	No	No	18 "	No	Yes	Broad; transfixed; ligated in three sections.	R	Adherent portions of cyst wall to cæcum and uterus left.
No	No	No	23 "	No	No	Long and slim; transfixed and ligated.	R	
No	No	No	19 "	No	Yes	Broad; ligated in three sections and cauterized.	R	
No	No	No	19 "	No	Yes	Broad; transfixed and ligated.	R	

No. of Operation.	Date.	Name.	Age.	Kind of Tumor.	Which Ovary.	Catamenia Since.	Children Before.	Children Since.	Married or Single.	Health Since.	Incision.
25	'80	Mastin........	39	Parovarian cyst..	R	Yes	......	......	M	1883 good	S
26	Aug., '81	M, Herman....	7	Sarcoma.........	R	No	No	No	S	Good	L
27	June, '82	Peterson.......	24	Multiloc. cyst...	R	No	No	......	S	Good	S
28	Feb., '83	Allen, Mary...	18	Multiloc. cyst....	R	Yes	No	No	S	Good	S
29	June, '83	Connelly, Bdgt.	47	Multiloc. cyst....	R	No	Yes	No	M	Good to death	S
30	" '83	Mackey, Maggy	23	Simple cyst......	R	Yes	No	No	S	Good	S
31	" '83	O'Neil.........	48	Multiloc..........	R	No	No	No	M	Good	S
32	'84	Dwyer, Marg..	46	Dermoid cyst....	L	No	Yes	No	M	Fair	L
33	'84	Haggerty, Nel.	19	Simple cyst	R	......	No	......	S	Good	S
34	Sept., '84	Riley, Mary...	25	Multiloc. cyst....	L	Yes	No	No	S	Fair	L
35	'84	Emerson.......	33	Double papillomatous cyst	R & L	Yes	No	No	M	Good	S
36	Nov., '85	Murphy........	44	Multiloc.........	R	No	5	No	M	In 1886 good	S
37	June, '85	Rush	43	Multiloc. cyst...	R	No	Yes	No	M	Died	S
38	April, '85	Piper	51	Double ovarian..	R & L	No	Yes 5	No	M	Poor Died 2 mos.	S
39	Sept., '85	Morrill	29	Dermoid cyst....	L	Yes	No	No	M	Good	L
40	" '85	Patterson......	37	Multiloc. cyst....	L	Yes	Yes 2	No	M	Fair	S
41	'86	Holland:.......	78	Multiloc. cyst....	R	No	Yes 8	No	M	For 1 year fair	L
42	Jan., '86	Ripkow........	49	Multiloc. cyst....	R	Yes	Yes	No	M	Good	S
43	Aug., '86	Lewis	31	Multiloc. cyst....	L	No	No	No	M	Poor	L
44	'86	Meehan........	25	Uniloc. cyst.....	L	Yes	No	No	S	Good	S
45	'86	Bick, Honora..	23	Colloid	R	......	Yes 2	No	M	Good	L
46	June, '86	Anderson......	43	Uniloc. cyst.....	L	No	No	No	M	Fair	S
47	'86	Conroy	52	Multiloc. colloid.	R	Yes	Yes 12	No	M	Good	S
48	'87	Mitchell, Mag.	13	Multiloc. cyst....	R	Yes	No	......	S	Good	S
49	'87	Muldahl	37	Multiloc.........	R	Yes	No	No	M	Good	S
50	'87	Hamilton......	44	Multiloc.........	R	No	Yes	No	M	Good	S

Rupture.	Ligatures Heard From.	Twisted Pedicle.	Weight.	Drainage.	Adhesion.	Pedicle, Kind and How Treated.	Result.	Remarks.
No	No	No	23 "	No	No	Broad; ligated in four or five places.	R	Enucleated.
No	Yes	No	14 "	No	Yes	Long; transfixed and ligated.	R	Died three years subsequent; return of disease in pancreas.
No	No	No	35 "	No	Yes	Long and slender, transfixed, ligated, and cauterized.	R	
No	No	No	28 "	No	No	Broad and short; transfixed, ligated in four sections and cauterized.	R	
No	No	No	34 "	No	Yes	Four inches long and three broad; transfixed, ligated, and cauterized.	R	Died 1885.
No	No	No	16 "	No	No	Moderate; transfixed, ligated, and cauterized.	R	
No	No	No	37 "	No	Yes	Broad and short; transfixed, clamped, cauterized, transfixed, and ligated.	R	
No	No	No	18 "	Yes	Yes	Short; transfixed, ligated, and cauterized.	R	Bone, teeth, hair, etc. Died in 1886.
No	No	No	32 "	No	No	Broad and thin; transfixed, ligated, and cauterized.	R	
No	No	No	27 "	No	Yes	Thick and broad; transfixed and ligated in three sections.	R	
Yes	No	No	38 "	Yes	Yes	No pedicle; everything ligated and cauterized.	R	Large amount of fluid drained off.
No	No	No	52 "	No	Yes	Narrow and short: transfixed, ligated, and cauterized.	R	Catamenia ceased two years previous.
No	No	No	40 "	No	Yes	Transfixed and ligated.	D	Death in six days from obstruction of bowels.
No	No	No	4 "	Yes	Yes	Short; transfixed, ligated, and cauterized.	R	Died two months after; cancer of rectum.
No	No	No	18 "	No	Yes	Broad and thin; transfixed and ligated.	R	Surface of uterus sewed over for hæmorrhage.
No	No	No	35 "	No	No	Long; transfixed, ligated, and cauterized.	R	
No	No	No	43 "	Yes	Yes	Broad; ligated in four sections and cauterized.	R	Tapped three times. Died one year subsequent.
No	No	Yes	25 "	No	Yes	Long and narrow, and twisted three times; suppuration commenced; ligated below the line of demarkation.	R	Uterine hæmorrhage previous. Ventral hernia subsequent.
No	No	No	22 "	No	Yes	Short; transfixed, ligated and cauterized.	R	
No	No	No	26 "	No	Yes	Transfixed, ligated, and cauterized.	R	Peeled out.
No	No	No	27 "	No	Yes	Fair: transfixed ligated, and cauterized.	R	Dug out before removal. Twenty-two stitches.
No	No	No	30 "	No	Yes	Slender; transfixed, ligated, and cauterized.	R	Both ovaries removed. R. ovary diseased.
No	No	No	26 "	No	No	Broad and short; ligated in three sections.	R	
No	No	No	18 "	No	No	Broad and long; transfixed, ligated, and cauterized.	R	
No	No	No	36 "	No	Yes	Long and thick; transfixed, ligated, and cauterized.	R	
No	No	Yes	21 "	No	Yes	Twisted and long; transfixed, ligated, and cauterized	R	Uterine hæmorrhage and peritonitis previous.

DISEASED GALL BLADDER WITH GALL STONES.*

Mrs. G. Merrill, Wisconsin, age 37, Norwegian, housewife.

This patient comes with a tumor in the right hypocohonoriac region which has given rise to an extreme degree of trouble for months. It has caused her so much discomfort that her physicians are satisfied that some active interference must be adopted to relieve her of her difficulty. The tumor is easily palpable in this region of the body, and may be one of two conditions. It can be moved to exactly the situation of the gall bladder, and it may be a distension of that organ. The patient, however, does not have the symptoms of an enlarged gall bladder caused by a closure of the common duct. There is no discoloration of the fæces or urine, and there is no history of attacks of colic, such as we should expect if it were a dilatation of the gall bladder from the passage of a gall stone. She suffers from the weight of the tumor and from pressure upon the pyloric end of the stomach, which gives rise to disturbance of that organ.

Again, the tumor is in a neighborhood in which an enlarged kidney is not infrequently found, and I am inclined to believe that the trouble is in connection with the kidney, from the fact that we have none of the symptoms present of trouble of the gall bladder, and from the fact that the tumor is so extremely movable. It can be pushed back to the normal position of the kidney, to the mid line, and downward some distance below the margin of the ribs. Very frequently the symptoms of which she complains accompany a movable kidney. If this is a movable kidney, it is enlarged, for the mass is considerable larger than the normal organ. It will require an exploratory operation to absolutely settle the diagnosis.

Of course, the instruments which you will need in this operation are the same that you will need in any other laparotomy. The incision is just the same as I have illustrated. A free incision is made through the linea semilunaris and the peritoneal cavity is reached and opened.

I find that the tumor is a cyst connected with the under surface of the liver. It is a very important case, as it illustrates what I have told you regarding the mobility of the liver. In this case you see it moves quite a distance from the position marked out for it anatomically.

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* Clinical lecture.

You are now able to see the cyst projecting into the wound. It is in the situation and has the appearance of the gall bladder. We will now proceed to do what I told you to do in the last lecture, We will isolate the gall bladder by packing these sponges around it, then we will aspirate it. If there is any leaking it will be picked up by the sponges. We have removed half a pint of a viscid yellowish liquid. Now we seize the relaxed wall with two pair of hæmostatic forceps and make an incision between them sufficiently large to introduce the finger for the purpose of exploration.

I now have my finger in the gall bladder and I find a stone in just the same position that I tried to demonstrate to you on the board in my last lecture. It is imbedded in the sac formed by the wall of the gall bladder, and before I can remove it, I must peel it out of the sac which it has made for itself,

There must be some defect in the history of this case, in that we get no history of gall-stone colic. Or it may be one of the conditions which I mentioned, in which the gall stones are contained in the gall bladder and close the cystic duct alone.

I shall now see if I can get behind the stone which I find embedded and see if I can push it out from behind. Those of you who are near can see the stone just coming through. You have an admirable illustration of an encysted gall stone, and it is impossible to get them out in such cases until you have dilated the tract behind them. I have now succeeded in removing four gall stones and I am able to feel the common duct throughout its entire course and am pretty well satisfied that I have removed them all. If there occurs what I expect in this case, a free flow of bile, I shall bring the patient in and show you the great excess of the fluid.

Another symptom is absent. The gall bladder has its normal healthy appearance. Had the stone reached the common duct, causing the characteristic white fæces and the icteric condition of the skin, the duct and gall bladder would have been black from congestion.

This opening in the gall bladder is a little larger than is necessary, hence I shall decrease it a little by sewing up the corner of the wound with Lembert sutures in the same way that we unite wounds in the small intestines. I shall now sew the edges of the wound in the gall bladder to the edges of the peritoneum some little distance from the edges of the incision of the abdominal wall.

It is astonishing how quickly the bladder walls retract, after having been emptied of its contents. I have now completed the circle, and have united the gall bladder to the abdominal peritoneum all the way round. This one stitch will be passed through the abdominal walls, catching in its bite the lower margin of the gall bladder. Another will be introduced at this point, the two stiches in this way completing the suturing of the wound of the gall bladder.

There is one peculiarity about all of these cases of biliary obstruction, and that is that the vessels, even the small ones, are very prone to bleed. Even after they have been compressed for some time and twisted as well, they still bleed and require a ligature. Especially is this true when the blood is loaded with bile.

Always be careful when sewing up wounds in the abdominal walls, to include all the tissues in the bite of the ligature. In a patient with flabby walls, as in this case, it is a very easy matter not to pick up all the different layers of the abdominal walls, and then, of course, there is a greater liability of a hernia in the track of the incision. I might add that this patient was delivered of a child only four months ago, which, perhaps, makes the abdominal walls more flabby than they would otherwise be.

I shall now fasten the edges of the wound in the gall bladder to the edges of the skin all around, and in that way I shall get complete and perfect occlusion of the cavity of the gall bladder from the peritoneal cavity. This is a comparatively easy case to treat. The marjority of cases which you meet will have gall bladders so small that is with it great difficulty that you will be able to get them out into the abdominal wound.

This is the most favorable case that I have seen out of quite a number. It is always well to be very careful about the external incision, and, in addition to the deep sutures, it is well to go over it again and introduce superficial integumental sutures between the deep ones.

This is the most completely spherical gall stone that I have ever seen. The reason for this is that it was caught in the duct and was not allowed to impinge against other stones. This one is octahedral. It is marked, as they usually are, by black spots which vary, much to their beauty. They are usually conical in shape, marked here and there by a facet where they come in contact with a neighboring stone.

There will be a very heavy antiseptic dressing of gauze and borated cotton applied to this wound, which will be changed as often as it is saturated by the excessive flow of bile. At the end of a week the wound will be healed and the stitches will then be removed. The drainage tube will be left until we are sure that the common duct is free, whether at the end of one, two, three or four weeks. You can determine this very readily by knowing that the bile is passing through the natural channel. The fæces will resume their normal color, the icterus will disappear and the flow of bile from the drainage tube will cease. This stage being reached, you remove the drainage tube. The question "what will you do with the fistula?" is often asked. You are to do nothing with it. If the common duct is free, the fistula will contract and close by cicatricial tissue, in spite of all you do. But, on the other hand, if the common duct is not free, the fistula will not close in spite of anything that you can do. It will remain open and the gall will flow out of it, being the only way that the patient can get relief. (I might have said "she" for the most of the cases occur in females.) So then you are to have no anxiety about the closing of the fistula, for it will close of its own accord if the common duct is free. You will sometimes have a condition in which you are unable to keep the common duct free, though you remove all of the stones obstructing it.

A condition of abrasion caused by the removal of a stone, may set up an inflammation which will result in a stricture of that canal, just as you have a stricture of the urethra, or the pressure of the stone may cause an ulcer, which upon healing may leave a stricture.

The first case in which I operated for gall stones was not relieved by the removal of the stones. The icterus continued after the operation, the urine continued to be charged with bile, and the fæces lacked its presence. So at the end of eight weeks I opened down upon the gall bladder again, and passing a sound into the cystic duct, found a constriction of that duct. Relieving the constriction relieved the patient, The history of that case was that the patient had experienced attacks of gall-stone colic, that the inflammation therefrom had caused an adhesion of the walls of the gall duct. The passage of the sound relieved the patient until the same conditions prevailed again by the adhesion of the ulcerated surfaces of the duct causing obstruction of the duct as before. The relieving of the gall stones, therefore, will not always relieve the symptoms to which I have called your attention, but will relieve the gall stone colic.

This patient did not have biliary colic because the large stone has not reached the common duct. It caused an obstruction in the cystic duct, and the mucous secretions of the mucous membrane lining the gall bladder had filled the bladder to the extent of half a pint, which you saw us remove. The pressure of the fluid in the bladder was not sufficient to carry the stone through into the common duct in the length of time that it had been there.

A week later.

You recognize this patient as being the one from whom we removed the large spherical gall stone and three smaller ones a week ago to-day. The patient has done well, as you see. The wound has healed perfectly, except at the position of the upper two or three stitches where there is a little suppuration. We could scarcely expect to keep the wound perfectly aseptic, when we take into consideration the fact that the gall stones had remained so long in the gall bladder and that along with the large amount of mucous secretions which were found in the bladder pus was found. This fluid coming in contact with the wound would, of course, be very likely to infect it. However, we have no anxiety about the case, for the little abscess has opened of its own accord and has discharged its contents. We will now remove the drainage tube. The patient will be perfectly well in a few days more.

CHAPTER II.

GUN-SHOT WOUNDS OF THE STOMACH.*

On September 20, 1890, at 7 o'clock in the evening, J. C., 44 years of age, Irish, with excellent physique and a good family history and previous history, was shot with a No. 44 calibre revolver, in the hands of an antagonist close to his person. After being examined by a physician, shortly after receiving the shot, he was driven to his home, a distance of four miles, in an ordinary cab. He was seen by myself about 9 o'clock, two hours after the reception of the injury. His general condition was that of well marked depression, as shown by great pallor of the surface, coolness and moisture of the skin, rapid pulse and severe pain in the abdomen. He had been, and was still, vomiting large quantities of blood at somewhat irregular intervals. Examination showed a large sized, ragged bullet wound through the skin, situated about an inch above the umbilicus and one inch to the right of the mid line. The edges of the wound were blackened and more ragged and bruised around the right half of the circumference, calling attention to the fact that the bullet came from the direction to the front and right; its course was towards the left. This was confirmed by subsequent inquiry as to the position of his antagonist at the time the shot was delivered. The bullet wound was surrounded by a large area of discoloration from ecchymosis.

Diagnosis—Perforating gun-shot wound of the abdomen, the stomach being the viscus injured.

Immediate abdominal section was advised and consented to. The operation was done with the assistance of Drs. J. F. Williams and A. J. Ochsner. The patient was anæsthetized with chloroform; the light from two lamps and a gas fixture was all that could be obtained. The patient was prepared by a thorough scrubbing of the abdomen with soap and water, then carbolized water 2 1-2 per cent. solution, then the surface was washed with alcohol and ether. The neighborhood of the operation and the patient's body for some distance away was covered with towels wrung out of a 2 1-2 per cent. solution of carbolic acid. Every precaution possible was taken to prevent the introduction of septic material into the wound. All preparations were completed in ten minutes.

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* A case reported to the Chicago Medical Society.

An incision was carried from the end of the sternum to the umbilicus in the mid line. When it reached the linea alba, it was found that the bullet had gone through the abdominal walls directly in the course of the linea alba, making an opening sufficiently large to admit the finger with ease directly into the abdominal cavity. The incision was carried through all of the tissues of the abdominal walls to the full length of the external incision. As soon as this was done, a large mass of omentum came into view, lacerated and torn by the bullet, and its meshes filled throughout with large clots of coagulated blood. It was carried out of the wound into the chest walls and protected with a towel wrung out of warm water. In lifting it out, the transverse colon was also drawn out of the incision and exposed fully to view; it was found uninjured. As the colon was drawn out its meso-colon was put upon a stretch and its surface plainly exposed to view. A lacerated wound was found in it, extending its whole length, that is from a point close to the colon to the vertebral column, from the edges of which blood was slowly oozing. No vessels of any great size were divided or seemed to need a ligature. After making this rent in the meso-colon, the bullet's course could not be determined, nor was it sought for. It was then thought best to search for any wounds that might exist in the intestines. The whole course of it from the duodenum was passed under the inspection of the finger and of the eye, by drawing small portions of it in succession into the lower end of the wound and returning them into the abdominal cavity as soon as a satisfactory examination had been made. No injury of any kind was found and the subsequent history of the case shows that none existed. The mass of omentum outside of the abdomen was pushed into the lower end of the external incision, and to one side; the stomach was sought for, found and drawn through the external wound. At once there came into view a large sized, open bullet perforation through the anterior wall, and three inches from the pyloric extremity and equidistant from its curvatures. There was no eversion of the mucous membrane;

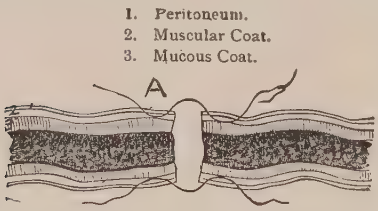
blood was flowing very freely from its edges. The stomach was rather full of fluid blood. The middle finger was introduced into the opening, entering easily and without causing constriction. The opening supposed to exist in the posterior wall of the stomach was sought for by this finger in the cavity of the stomach. It was some time before it could be located. When found the end of the finger entered it readily; it was ragged, torn and bleeding profusely from the edges. In making use of the rent found in the meso-colon, it was easily brought into view upon the end of the finger. Two silk ligatures were applied to the two halves of the circumference of the perforating wound; in this way the bleeding was controlled completely. The edges of the wound were then inverted into the stomach and broad surfaces of the peritoneum on the opposite sides of the wound were sewed together by very fine continuous silk sutures. The needle used was the ordinary cambric needle and was introduced merely through the peritoneal and muscular coats of the stomach. The first row of sutures was reinforced by a second row applied in the same way. When the sutures were first in position the wound had all the appearance of being a straight cut one. The wound through the anterior wall was treated in an exactly similar manner, by controlling the bleeding by ligatures applied to the opposing halves of the wound and also by the introduction of two rows of continuous silk sutures. The rent in the meso-colon was then carefully closed by the continuous silk suture applied throughout its entire length, bringing together uninjured portions of the peritoneum, after thoroughly cleansing the surfaces and edges of the wound by free sponging. The blood vessels in the wound of the meso-colon were so perfectly closed by laceration caused by the bullet, that they showed no disposition to bleed. The toilet of the peritoneal cavity was then made with great care; everything being sponged and cleaned away, all blood, blood clots and all other foreign material found in it was removed. The omentum was cleaned of its blood clots as perfectly as possible and was returned evenly and smoothly into the peritoneal cavity. The external wound was closed with ordinary silk sutures passed through all of the layers of the abdominal walls. The track of the bullet in the abdominal wall was disturbed in no way except that a strand of gauze was passed for some distance in its course. This wound gave no further trouble whatever in the course of the case. The ordinary dressing of iodoform, iodoform gauze and borated cotton retained in place by a broad bandage, was applied. The operation was completed in thirty minutes. The wound of incision healed *per primam* except the development of a stitch-hole abscess, moderate in size, confined to the course and neighborhood of the two lower stitches, those nearest the umbilicus; it was entirely superficial and was probably infected through imperfect cleaning of the cavity of the umbilicus in the preparation of the patient. It developed about the sixth day, was opened, discharged its contents and cicatrized in a few days. The sutures were all removed on the eighth day. The pledget of gauze placed in the bullet wound was removed on the fourth day, perfectly unaltered and aseptic. This wound closed promptly. The patient took the anæsthetic kindly. He vomited once, just before being removed from the table to the bed, after the operation, ejecting from his stomach fully a pint of fluid blood which had collected therein before the application of the ligatures to the edges of the wound in the stomach. This was the last blood vomited by the patient. Gas passed from the bowels from the very first day. The bowels were moved freely and thoroughly on the fourth day by giving the patient three teaspoonful doses of sulphate of magnesia at intervals of four hours. The patient was not troubled with distressing symptoms at any time, nor did he have pain of noticeable severity. For the first two weeks he was annoyed and irritated very much by the presence of a persistent hiccough, coming on at irregular intervals and lasting for a variable period of time. It was probably due to some injury done to the solar plexus of nerves, and seemed to be uncontrolled by the few remedies that were tried, so they were discontinued; it gradually disappeared as improvement occurred. His temperature reached 101 degrees and was never a source of anxiety. His pulse became regular and normal after the first day. He was allowed no food by the stomach for the first week, nothing but small drinks of water, and was nourished by enemata. After this he was allowed small quantities of koumiss and milk, gradually increasing in quantity as his improvement continued. The third week he was allowed eggs and other soft food. On the 25th day after the operation he was found sitting up in his room, dressed and feeling well in every way except the weakness following the severe injury and his forced abstinence from food.

And now after a period of two months and a half the patient appears before you feeling as well as he did before. He gladly gives me this opportunity of showing you the situation of the wound and of calling your attention to some facts with reference to it which I think are of importance. (Abdomen exposed, showing scar from gun-shot wound.) You notice here is the bullet wound, well below the tenth rib. The shot evidently passed into the abdomen. The direction of the bullet was at first upward and backward, but striking a button on the clothing, its course was changed to downward and backward, from the mid line of the abdomen. It takes but very little to deflect a bullet from its course, as those of you readily know who are Nimrods. You see a squirrel high up in a tree, your aim is perfect, you are sure that your shot will be successful, but on finding the game does not fall, you look carefully among the limbs and see a little twig that has deflected the course of the bullet enough to miss the mark. And in just such a manner, according to my idea, is the course of a bullet changed in its passage through the body; and the deflection is not due to some absurd contortions of the body, as some would have us believe. Why should the course of the bullet not be deflected from its course in passing through the abdominal wall by the aponeurosis of the external oblique muscle or other tendons which may be in its course?

Illustrating the case to you by this chart, I can show you the extent to which the meso-colon was injured. The bullet passed along its entire extent, lodging in the spinal column, perhaps. We did not search for it nor bother about it in any way. It was fortunate that there had been a rent made in the meso-colon, so that I could better follow up the course of the bullet and determine the amount of injury done to the stomach. We examined the small intestines loop by loop, a little at a time, without doing them a particle of injury, and finding that they were not injured. I then remembered that the main symptom was hemorrhage, and that there must be hemorrhage in connection with the stomach, or he would not have vomited the large amount of blood which had come from the stomach. So the stomach was examined. Some of my friends were curious to know how I was able to find the perforation on the posterior surface of the stomach. It is very simple. If I have a globular body of which I cannot see the posterior surface, if a bullet has passed through it, all that is necessary to find the posterior opening is to insert the finger into the opening next to you and feel about on the internal surface of the posterior wall until you find the perforation. I found that the hemorrhage was from smaller branches near the point from which they were given off from the main branches. I proceeded as illustrated in this cut, passing the needle through as here shown and tying it in halves. The bleeding is stopped in this way without difficulty. The openings in the stomach were closed in the manner illustrated in this plate by Lembert sutures. The needle is introduced a little distance from the edge of the wound, the peritoneal and muscular coats are picked up and the needle is then carried beyond the wound and the peritoneal and muscular coats are picked up in the same manner on that side. A number of these sutures are applied and when they are tied the wound has the appearance of a straight incision. This being done and the blood vessels having been ligated the operation was over, excepting the closing of the external wound. The patient says that he is better than he ever was before the operation.

This leads me to say a word about gun-shot wounds of the intestines in general.

The cases of penetrating bullet wounds of the abdomen in which there is not sufficient damage to require surgical interference are so few in number that they may practically be disregarded. The opening which you make is nothing to the patient in comparison to the advantage he gains from the thorough examination which the surgeon is thereby enabled to make.



The first thing to do is to stop the hemorrhage. This you will do in one of the ways that I have already mentioned. Where will you make the incision? You will always make the incision in the median line of the abdomen if you can, and I am very sure that the exceptions where this can not be done are very rare. You can have a bullet going straight backward wounding the large, but not the small intestines; here the enlargement of the wound will be sufficient. Many such recoveries are recorded. Injuries of small intestines are much more serious and should be followed by a free incision in the median line sufficiently long to allow the operator to make the examination and repair necessary to lead to a cure. You can prove very easily by experiments on animals or the cadaver, that by an incision in the median line you are able to reach all parts of the abdominal cavity, whereas, by an incision laterally you are able to reach one side only.

We are a little enthusiastic on this subject because this great stride in intestinal surgery is due to the work done by American surgeons. However, we must not be too enthusiastic, for the majority of such wounds prove fatal in spite of all that can be done. It is not those cases that will absolutely prove fatal, but those that will recover under good surgical treatment which we must consider. I have already told you that the first thing to do is to control the hemorrhage. Of course, if the large abdominal vessels are injured the case will probably prove fatal. You readily understand why the bleeding is greater and more severe in the abdominal cavity proportionately. It is because the vessels are supported so loosely; they have not the firm tissues in which to retract nor by which to become compressed; they are given off from large vessels, and you know the larger the vessel from which a branch is given off, the greater is the amount of blood which passes through it in a given time. These facts are equally true in regard to the veins of this locality. I have seen instances of all the serious symptoms of secondary hemorrhage from the bleeding of a small vein in the pelvis. Hence the first thing to do is to open the abdominal walls and control the hemorrhage from the smaller as well as the larger vessels. Then the thing to do is to find the wound in the viscera. In my experience I have never opened the abdomen of a dog or a man, after receiving a gun-shot wound, without finding damage done to the contents of the cavity, so the next thing to do is to discover the extent of this damage. This you will find along the course of the bullet between the points of entrance and exit, but the change of position of the patient and the peristaltic movements of the intestines may have changed the position of the wounds

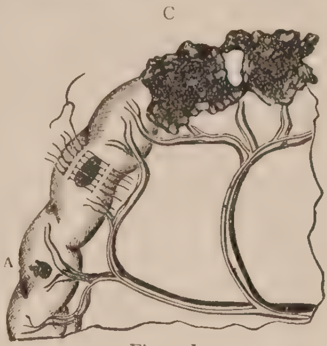


Figure I.

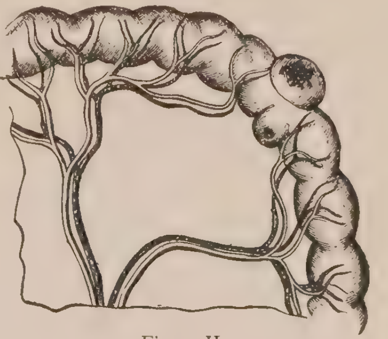


Figure II.

very materially. So far as the character of the wound is concerned there is the greatest diversity. A bullet may pass through the abdominal cavity and do very slight injury; the peritoneal coat of the intestine alone, or the peritoneal and muscular coats together, or the entire intestinal wall may receive the slightest or gravest wounds. The points of entrance and exit of the missile may not be a finger's length apart, all depending, of course, on the position of the intestine at the time of the injury. Again, the size of the wound depends in a degree upon the size of the bullet; the larger the bullet the larger the wound. This, however, is not always true. This plate (C. Fig. I) shows a wound in which the intestine is wounded beyond all recognition from a 22 calibre revolver; this other plate (Fig. 2) shows a very minute perforation from a No. 44. This proves to you the fact that you cannot tell the nature or extent of the wound, by any manner of means, until you have entered the peritoneal cavity. One of the results of my experiments as well as the operations on the human subject leads me to say that I have yet to see an abdominal penetrating wound in which there is not some extravasation of the contents of the wounded alimentary canal. I care not if the wound is so small that the eversion of the mucous membrane completely closes the opening; it is nevertheless mucous membrane; it has been in contact with the fæces; what has cleansed it, what asepticised it? It is septic and has infected the wound. The mere fact that you have mucous membrane turned out is a sufficient fact to prove that you have extravasation. Of course the microbes contained in the intestines frequently belong to the harmless varieties which might give rise to putrefaction but not to suppuration. But, you ask, how is it that if infection is so easy, we do not all become infected? Fortunately, we are so constituted that we are able to withstand the most of those invasions. In the majority of cases the extravasation is sufficient in amount to be seen with the eye and to be felt with the finger. In the case before you the mucous membrane of the stomach was not everted, as that viscus was empty. The extravasation was not sufficient to be felt with the finger, but I have no doubt that some of the contents of the stomach was forced into the peritoneal cavity. The wound of the entrance is always smaller than the wound of exit. You can tell but little of the nature of the damage done internally by the external wound; however, by considering the course of the bullet and by bringing before your mind's eye the organs lying in that direction, you can form some idea as to the parts injured, but the internal wounds will be revealed only on entering the peritoneal cavity. A method of diagnosis by the use of hydrogen gas injected by the rectum has been introduced by Prof. Senn. It is a very ingenious and useful method. If you have not the gas present, you can use air, introducing it with a Davidson's syringe. Wounds of large size may be treated without difficulty by turning the edges of the wound into the bowel and uniting the peritoneal surfaces. When the wound is on the mesenteric portion of the bowel the difficulty is greater, and will probably require a resection, as the arterial circulation will be shut off. As a rule, a suture can be run around the opening in the same manner as a string is run in a purse, and in this way the peritoneal surfaces are brought together.

You can successfully treat small wounds of the intestines, as I have said, with the circular suture, without difficulty or any anxiety regarding it. I have already told you that in six hours the peritoneal surfaces will be agglutinated, and in 24 or 48 hours the union will be firm. Another important point for you to remember is, that whether you use catgut or silk sutures, you must not draw the stitches too tightly, otherwise you shut off the circulation and your object is defeated just as it would be from shutting off the circulation in any other portion of the body.

You will have cases of lacerated wounds of the intestine which will lead you to consider whether you will remove a section of the intestine, or perform an anastomosis of the intestine. (The hour is up.) I wanted to say a few more things to you regarding this subject, but as the bell has rung I cannot.

GUN-SHOT WOUNDS OF THE SMALL INTESTINES.*

Mr. President and Gentlemen of the American Medical Association: The subject-matter of the remarks to be presented this morning was suggested to me by an article published in the *British Medical Journal* in 1882, from the pen of "that good man among men, and great man among doctors," J. Marion Sims.

The article in question was an appeal for operative interference in penetrating gun-shot wounds of the abdomen, in lieu of the "expectant treatment" so universally accepted and adopted by the profession, and which, in a few seemingly well authenticated instances, has led to recovery.

The appeal was uttered in behalf of the vast majority on the side of fatality attending these cases, and was based upon the deductions to be drawn from the recoveries following operations for diseases affecting the viscera of the abdomen and pelvis, during which the most terrible injuries have been inflicted upon the contents of these cavities—the peritoneum exposed for hours, as well as brought in contact with all kinds of foreign and usually irritating substances.

It is scarcely necessary for me to affirm in your presence the fact that, with few exceptions, the older writers and surgeons advocate the "expectant treatment" in the management of these injuries, while the younger writers and surgeons favor operations, pinning their faith upon the wonderfully favorable results attending the practice of Listerism, the purest of antiseptic surgical methods.

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* Read before the American Medical Association, May, 1884.

During the past few months I have instituted and carried out, with the valuable assistance of Mr. J. McDill and Drs. Anthony, Freer and Bolles, a series of experiments for the purpose of ascertaining the results to be obtained by immediate operations after these wounds, with the hope that the relation of the attending circumstances and events would be interesting as well as useful, by adding to the data now in our possession other data, from which may be determined more intelligently the course of action to be adopted when these cases come under our charge for treatment.

No attempt will be made to review the great question of penetrating gun-shot wounds of the abdomen, which would lead me beyond the scope of the paper. Nothing but a fair recital of the history of the experiments, with some application of the conclusions to be drawn therefrom, will be undertaken. With this intent in view there will be presented to you the accompanying phenomena, the manner of treatment and results of thirty-seven intentional gun-shot wounds of the abdomen, confining my attention entirely to my own observations, and exhibiting to you such specimens as I have been able to preserve, taken from the animals; both of those which died, and of those which were sacrificed, after recovery, to obtain the specimens. Experiments of like nature have been made upon animals by very many surgeons, previous to the application of their convictions of the necessity of certain procedures to relieve disease or the effects of injury on the human body.

No preparation of the animals selected for experiment was made, either as to choice of physical condition or surrounding circumstances, except that they were anæsthetized previous to being hurt. The wounds were produced by the ordinary Smith and Wesson revolver of 22, 32, 38 and 44 calibre, and by the 22 calibre rifle. The shots were given at short range, so the damage done by the bullet fairly represents the injury met with, either in military or civil practice, as the results of shots from the firearms now in use.

At first, no attempt wa made to give a definite direction to the course of the bullet, other than that it should perforate the abdominal cavity. The results soon confirmed the fact so well known, that the larger number of patients suffering from such wounds never come itno the hands of the surgeon, their injuries proving rapidly fatal.

This ending, we can readily understand, must be a common one, when we bear in mind the construction and nature of the viscera contained in the abdominal cavity, especially their great vascularity, having vessels of immense size supplying them with, and carrying away from them, the blood necessary for their nutrition and the performance of their special functions; not to mention the main systemic artery and vein coursing through the cavity in a position rendering them readily liable to perforation, death following speedily.

It was also ascertained that a severe perforating and lacerated bullet wound of the viscera, such as of the kidneys, of the spleen, and of the pancreas, could not apparently be treated successfully in any other way than by an absolute removal of the injured organ; and notwithstanding the reported successful removal of almost every important organ of the abdomen by one surgeon or another, the conclusion was reached that some of these organs must be left *in situ*, in order that the functions of life may be carried on.

Hence we were compelled to exert such control over the course of the missile as to have it produce a wound of the nature of those likely to come, and actually coming, under the care of the surgeon; so that the injuries became those confined to perforations and injury of the intestinal tube, with occasionally the injury of some of the larger special organs.

It will not be amiss to recall to your minds, very briefly, some of the triumphs of abdominal surgery, and more especially to impress the fact that shot wounds of the cavity and contents present many questions of prime importance which are not met with in, and do not complicate, ordinary operations for disease or injury with any free, external wound.

The removal of the spleen for acute wounds nearly always results in recovery; so also one kidney has been removed successfully, either for disease or injury, often enough to place the operation of nephrectomy among the list of justifiable undertakings.

Again, wounds of the intestinal tube of all degrees of severity, up to complete division by the resection of portions of the entire calibre thereof, have been successfully treated by surgeons, as is proved by the experimental researches of Dr. Traverse, the eminent Prof. S. D. Gross, Dr. Bell, and others, and confirmed by the experience of many surgeons during operations upon the human being for diseases of these cavities.

Still, in each of the examples mentioned, the circumstances were entirely different from what is found present in perforating gun-shot wounds of the abdomen. In the former, the peritoneal cavity was clear of blood and other extraneous substances; the prevention of their entrance entirely under the control of the operator. In the latter, blood in large amounts was always found present; and the peritoneum was smeared with the contents of the intestinal tube, necessitating prolonged efforts to secure a cavity clear of all hurtful substances. Of necessity the latter cases would be least likely to escape the probabilities and dangers of subsequent inflammation of the serous membrane.

Primary resection of portions of the intestinal tube, or entire removal of separate organs, are operations comparatively easy of performance, and are not necessarily attended with any damage to or exposure of any other portions of the abdominal cavity, outside of the immediate proximity of the site of the operation.

Extravasation and hemorrhage should be entirely prevented and controlled; and the peritoneal sac can be maintained perfectly clean during the time of, and after all the procedures required by the operation.

After gun-shot wounds, besides the resection or removal of any special organ required, there is great shock, and prolonged manipulation is necessary to obtain a proper cleanliness.

The recital in detail of each experiment would be tiresome and occupy too much time, so that your attention will be called only to the more important facts and circumstances determined by them.

There will be published with the paper a somewhat extended account of each experiment, from which individual inferences may be drawn. In addition, a short *resume* of the entire work will be given further along.

First comes the question of hemorrhage and damage to blood-vessels, as this is primarily the most common and certain cause of death, and demands the surgeon's first attention. In its excessive amount, occurring rapidly and suddenly, is to be found the explanation of the cases which are immediately fatal. This result will surely happen when the largest arterial trunks are severed by the bullet; further, its copiousness and persistency of flow, even when none but very small blood vessels are divided, involve a matter of serious concern, if not a fatal issue, either from the amount of blood lost, or in predisposing to septic processes from blood decomposition.

There is a remarkable persistency in the flow of blood following the severance of vessels in the abdominal cavity, perhaps dependent upon the laxity of the tissues through which these vessels course, the absence of pressure from surrounding soft parts, and the lack of the peculiar influence of the atmosphere, either from its weight or clot-producing power.

When the abdomen is opened immediately after the transit of a bullet, its cavity is found to contain a large amount of blood, the quantity, of course, being in proportion to the size of the vessels wounded, but always a disproportionately large amount, no matter what their calibre; further, the flow is still going on from vessels of all sizes. There seems to be slight disposition to the formation of an obstructive clot in the mouths of the smaller ones, and slow retraction or contraction of the walls of the larger.

Bleeding stops only when the heart ceases to beat in a faint from excessive loss, or when the amount of blood is so large that by its bulk, and weight, and distention of the abdominal walls, it makes pressure sufficient to occlude the open vessels.

The conditions are very quickly altered after air is admitted through the abdominal section. Clots rapidly seal up the smallest vessels; the smaller arteries spurt less forcibly and soon cease beating; the larger ones contract and retract, just as occurs in the wounds of soft parts in other regions of the body. This is in accordance with, and corroborative of, the experience in hemorrhages occurring in abdominal surgery in the human being. Few of us have failed to see cases like this: a patient dies suddenly, with all the symptoms of acute prostrating hemorrhage; post-mortem examination shows the abdominal cavity filled with blood; the blood is carefully cleared away in the search for the source whence it came; and when this is found, it is a matter of astonishment that such a vast amount of blood could come from so small a vessel. Perhaps it is a small vein of the ovarian venous plexus, or a minute vessel in the thin-walled sac of an extra-uterine fœtation, or the partially closed vessels in the shrunken stump of a recently removed ovarian or other tumor, or some recently divided adhesions, all of them vessels which, in any other part of the body, would be no item of concern to the surgeon, or need any of his special care to prevent bleeding from them.

The lesson taught by these facts is of imperative importance in all operations upon these cavities; and even if mastered, loses nothing by reiteration. Excessive hemorrhage being certainly the principal cause of speedy death in severe gun-shot wounds in this region of the body, where evidences of its presence are plainly exhibited, there can be no hope whatever of saving the lives of any of the wounded except by immediate abdominal section. This alone, by admitting air quickly, staunches the fast flowing current, and gives time for the application of the ordinary rules of surgery for the prevention of hemorrhage.

In order to be safe from subsequent trouble, every divided blood vessel must receive the surgeon's attention, occluding clots must be thoroughly sponged away, and in their stead must be placed the ligature or the sear of the actual cautery. If left without this restraint, and the abdominal opening be closed, the same conditions are restored as existed previous to the section; and as reaction comes on, bleeding will surely recur, and in large amount, leading to death from this cause alone, or furnishing a frequent source of septicæmia.

This fact again is corroborative of the experience of ovariotomists, the most successful being those who take the greatest pains to staunch all bleeding before closing the abdomen.

Following a resection of three or four inches of bowel and a ligation of two large subdivisions of the mesenteric artery wounded by the bullet, there occurred a mortification of several inches of the entire intestine above the site of resection. The mortified part corresponded with the distribution of the arteries wounded and ligated. This assuredly was an important fact to know, if at all likely to occur as the result of wounds of these arterial branches; even its accidental occurrence is a circumstance to be remembered. Its occurrence would surely add largely to the gravity of the cases in which it happened, probably necessitating a resection of a portion of the intestine corresponding to the area of distribution of the wounded vessel. The great freedom of anastamosis between the mesenteric arteries rather argues against their wounds being followed by any such hazardous result; still, the case recorded above required explanation. Two experiments were performed in order to determine whether destruction of the arteries alone was sufficient to lead to such mortification.

Both demonstrated that a closure of two or three of the largest subdivisions of the main mesenteric vessel was not in itself sufficient to produce death of the portion of intestine supplied by them. The experiments were as follows: An animal was anæsthetized, and the abdomen opened. A sufficient length of bowel was drawn through the opening to allow of the ligation of two large sets of vessels adjoining each, the ligatures including vein and artery. The parts were returned to the abdomen and the latter closed. At the end of thirty-six hours the wound was reopened. No very noticeable change was found in the intestine; pulsation had returned in the ligated vessels beyond the ligature. The external wound was again closed. The animal recovered in a few days so as to be as lively as ever.

A second animal was etherized, and a ventral section made. Three large vessels were ligated (veins and arteries), before their division into any branches. These three vessels lay parallel with each other. A ligature was also thrown around the anastomosing branch near the intestine which connected with a fourth larger vessel. There followed immediately very marked whitening of the bowel. The parts were returned and the wounds closed. The animal recovered promptly from the effects of the ether and the immediate effects of the operation.

It remained quite well for six days, when it grew ill. The wounds were reopened. Pulsation had returned beyond the ligature. There was no sloughing or mortification of the intestine. It was congested slightly and seemed paralyzed, and was of wider calibre opposite the distribution of the ligated vessels; this was the only change. There was a great deal of very offensive matter in the peritoneal sac, and notwithstanding the high grade of inflammation, there was no adhesion of intestinal folds except at one point. Here there was found a perforation of the intestine. Out of the opening there protruded a piece of wood which, upon being pulled out from the cavity of the intestine, was found to be four inches long, and connected with a large mass of twine. This had evidently been swallowed by the animal, and had gotten along safely enough until it reached the inactive portion of the tube corresponding to the seat of operation, where it was forced through the tube by the strong contractions behind it. Unfortunately, the animal was killed by the ether during the examination. Aside from this accident, the animal had a good chance of recovery.

The complication of a complete resection of the bowel, with a ligation of two or more vessels, is the only explanation to be given of the case where mortification occurred. The experiments prove that such result does not follow simple closure of the vessels by ligation.

The second item to be considered refers to the course of the bullet and the character of the damage done by it. Nothing can possibly be more uncertain and erratic than the track of the missile through the body. A contracting muscular fiber, an edge of fascia, the elasticity of the skin, a surface of bone, or a distended knuckle of intestine, each and all of these at times present obstructions sufficient to divert it from the direct line of its flight. It is certainly astonishing what very extensive and severe lacerations of the intestines are produced by so small a bullet as one of calibre No. 22, Fig, I. c.; the entire circumference of the bowel at some points being mangled beyond recognition; again, it is equally surprising how minute are the perforations made by the large No. 44, Fig. 2. As a rule, the larger the calibre of the bullet the larger the wound.

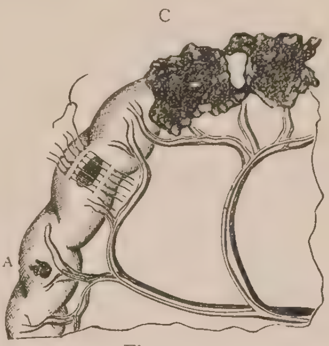

Figure 1.

An estimate of the direction of transit, based upon the points of entrance and exit, is purely conjectural, and furnishes no standard whatever by which we may judge of any supposed injury to any organs known to lie in such course. In one experiment, the bullet made four openings through the abdominal walls, and did no damage other than contusion of two knuckles of the small intestine and gouging the serous membrane.

The animal had a remarkably deep furrow along the course of the "linea alba." The bullet entered the right side of the abdomen obliquely, two inches from the mid line, perforated its walls, and coursing to the left, furrowed the peritoneum in its passage; was evidently deflected outwards, immediately before reaching the linea alba, by a knuckle of intestine, which it contused slightly.

Here it made its first exit through the walls, passed to the left side of the mid line, again perforated the abdominal walls, and, furrowing the peritoneum upon the left side, finally made its second exit through the abdominal walls three inches to the left of the linea alba. Near its place of final exit, a second knuckle of intestine was found badly contused. The contusion was so severe and extensive that it was thought best to resect a length of one inch. The animal recovered.

In a second instance, the bullet entered the cavity about two inches to the right of the linea alba, on a line with the umbilicus, with a direction upwards and to the left side. It made its exit nine inches to the left of the mid line, and just at the lower edges of the last rib. On opening the abdomen the stomach was found greatly distended, entirely concealing the other viscera from view, and presented two large perforations in its walls about two inches apart, from which some blood, mucous, and food were found running into the peritoneal sac. The wound to the right, in the stomach walls, was the smaller, and situated directly opposite the entrance perforation in the abdominal wall, having the same direction. The wound to the left in the stomach walls (two inches to the left) was the larger, very ragged, and had evidently been made by the bullet deflected forward at its first entrance into the stomach. After leaving the stomach the bullet impinged upon the inside of the abdominal walls just to the left of the mid-line, and then, instead of perforating them at that point, was again deflected upwards and to the left, merely furrowing the peritoneum along the remainder of its course to the point of exit mentioned. The wounds of the stomach were inverted, as it were, into the cavity of that organ, by bringing its peritoneal surfaces surrounding the wounds in contact with each other by means of the continued catgut suture. The abdomen was carefully cleansed of blood, etc., and the wounds in the walls closed in the ordinary way. The animal speedily recovered from the injury, without any uncomfortable symptoms. During the recovery from the effects of the ether, the animal vomited considerable quantities of blood, giving an additional evidence of the perforation of the stomach.

There were two cases in which the bullets perforated the abdominal walls, and in their transit did no injuries to the viscera, in which the points of entrance and exit were five and six inches apart. In each instance the only damage done was a furrowing and laceration of the peritoneum along their entire courses, the blood from the track of injury falling into the abdominal cavity. In one experiment, the bullet failed to penetrate the abdominal walls and was subsequently dissected from between the muscles. On opening the cavity, quite a rent was found in the spleen opposite to the seat of the external bullet wound, from which blood was freely flowing. There was neither abrasion nor perforation of the peritoneum. This case may suggest the probable cause of death in some fatal cases from non-perforating wounds. The laceration was evidently caused by concussion alone.

Other instances might be cited to illustrate the exceedingly great uncertainty as to the course taken by the bullet, and as to the organs probably impaired. They would also confirm the possibility of perforations of the walls without accompanying injury to the contents of the abdomen. Still, no instance was shown of failure to produce a wound thereof when the bullet's course lay among the intestines. Their safety followed deviation by glancing.

The wounds of the intestines may be many in number and situated very near to each other (Fig. 3) so that one resection including all the openings will constitute the only operation that furnishes relief.

Again, the openings may be few in number and widely removed from each other; and if each wound is large, and the damage to the tube extensive, such as is usually produced by a 32, 38 or 44 calibre bullet, three or four resections are necessary. The latter are the most difficult cases to manage and most fatal in their results. The position of the points of entrance and exit of the bullet in the intestines is subject to immense variety, even in simple cases. It may involve only the top of a knuckle of intestine, merely opening the cavity thereof. The points may be so near each other that only a half inch or less of intestinal wall separates them from each other. (Fig. 1, a.) The bullet may merely cut off the mesenteric junction opening into the cavity more or less freely. The intestine is often perforated transversely near the

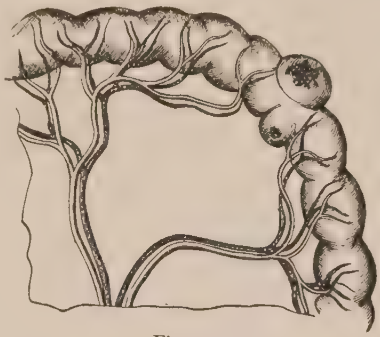

Figure 2.

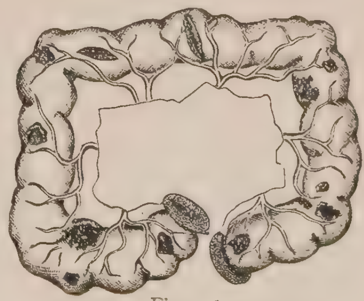

Figure 3.

middle, or longitudinally; in the latter case the bullet, entering at one point, courses along in the cavity of the tube for some inches, and then makes its exit.

All of these varieties depend upon the situation of the intestinal folds with reference to each other at the time of the transit of the bullet. One case showed 10 complete perforations in 18 inches of length of the ileum, Fig. 3.

Extravasation of the contents of the tube was present in every instance where there existed the slightest degree of perforation. These contents were forced out into the peritoneal cavity, or on to the surface of the intestines, if the wound was large, by the bullet itself, and the normal tonic contractions of the bowels; and, if small, perhaps by the latter alone. This facility of extravasation agrees with my experience in wounds of the intestine in the human being. I have personal knowledge of two instances in which the medium-sized aspirator needle was employed to relieve tympanitic distention of the tube with success so far as getting rid of the gas was concerned, and giving great temporary comfort to the patient. Death ensued from the disease. Post-mortem examination in each case demonstrated the presence of fæcal extravasation at the seat of the needle puncture. It would not be an arduous task to collate instances of this accident in the practice of others, where this plan has been adopted. It is difficult to understand how any other result could follow a perforation, if there be contents at the seat of the puncture, when we remember how strong and constant is the action of the circular muscular fiber. It is stated that the protrusion or eversion of the mucous coat, which ensues very rapidly after complete division of the walls, acts as an immediate stopper of wounds of small size, say one-eighth of an inch in diameter. This may be true in incised wounds, but it was not shown to exist in a single one of the several hundred perforations coming under my inspection as made by the bullet. The latter tears away and lacerates the parts through which it passes, and perhaps paralyzes the muscular fibers in its immediate neighborhood, but whatever the cause, there was no instance in which the eversion of the mucous membrane was sufficient to prevent extravasation.

Recognizing the very deleterious influence of this material upon the peritoneal membrane, this fact of the great certainty of extravasation adds another point to the argument in favor of abdominal section in these cases, as furnishing the only means by which this source of trouble can be absolutely eliminated.

As part of the extravasated material from the wounds of the intestine, it was an exceedingly common thing to find intestinal worms of all kinds, and in large numbers protruding from the rents or free in the serous cavity.

In the treatment adopted during these experimentations, it was found necessary to make an extensive external incision, freely exposing the abdominal cavity, in order that all the viscera might be thoroughly and carefully examined, and every wound brought within reach. In a majority of instances the median line gave space enough, in two the bleeding vessels could not be reached without a lateral prolongation toward the flanks.

There was no reason to suppose that the extent of the incision added very much, if at all, to the gravity of the operation. After opening the abdomen, the intestines were all turned out, critically examined for perforation or contusion, the situation of these fixed, and the hemorrhage therefrom controlled by means of the snap forceps, after which wounds of special organs were sought for. If the substance of the spleen or the kidney was found perforated, the organ was immediately removed after ligating its blood vessels, the stump being returned to the abdomen. If slight lacerations only at some point on the surface had been produced, these were closed by bringing peritoneal surfaces of the organ over the wound by means of the continued suture.

The peritoneal sac was then carefully and thoroughly cleared of blood and other extraneous substances by repeated sponging or irrigation. The intestines, which during this process had been protected by being enveloped in towels wrung out of warm water, were now cleanly sponged, while all unwounded portions were returned to the abdomen.

It seems to be of little consequence whether or not the intestines be returned to the cavity in any definite order—in fact, it is doubtful whether they are ever returned precisely to the same positions they originally occupied before being disarranged during the operation. Still, some care must be used in order to avoid the accident which happened in one experiment. After the divided ends of the intestine had been united, it was found that during the manipulation one of the ends had in some way been passed through an opening in the divided mesentery, so as to produce a figure of eight convolution in the tube. It was left in this shape. The animal recovered, and I have the specimen with me to demonstrate the perfectness and security of the union in the intestine at the place of reunion. The animal was sacrificed to secure the specimen six weeks after the operation. The abdominal cavity was quite free from evidences of inflammation, except where the misplaced folds lay in contact with each other. At this point slight peritoneal adhesion had formed between them.

Where several wounds occurred rather close together, severe enough to destroy a considerable portion of the integrity of the bowel, one resection was made to include all of them, even when he length of intestine removed measured ten inches or more. Where the points of injury were widely separated from each other and extensive damage done at each point, several resections of a length of the tube just sufficient to include the injured portions were made.

In the former case, in which several inches of the tube were taken away, the mesentery was ligated as close as practicable to the intestine (Fig. 7), in sections corresponding to the number of blood vessels going through it to the resected portions. The mesentery was then divided close to the intestinal wall, and a "V" shaped portion of it removed. After this, the tube itself was divided, and the wounded portion removed. One artery, always needing ligation, was found in the divided ends at the point of junction of the mesentery with the intestine. Before the final division of the intestine, its contents were pushed back out of the way, compression exercised upon its walls by a pair of forceps or a temporary ligature, in order to prevent extravasation of its contents through the divided ends. The mark of constriction made by the forceps or ligature, used to closed the lumen of the bowel, was to be plainly seen several days after the operation. The safest compression can be made by an assistant's fingers. Results soon demonstrated the paramount necessity of carefully selecting the place for final division of the intestine, in order to avoid sloughing of the edges approximated together, the results being best in those cases where the division was made close to the point at which any given mesenteric artery approached nearest to the intestine, as compared with those where the cut was made in the intervals between any two branches of these vessels, and this was seemingly dependent on the better supply of blood belonging to the former cases. Immediately after division of the intestine, there followed an instantaneous, regular and considerable contraction of the calibre of the tube (Fig. 4, a), close up to the divided edge, caused by the action of the circular muscular fiber. The diameter was often diminished more than half by this contraction. This persisted for a time, but was soon followed by an eversion of the mucous membrane, which rolled out and over the constricted portion in a remarkable manner. (See Fig. 4, a, b and c.)

This protrusion of the mucous membrane forms a serious obstacle to easy and close approximation of the ends of the bowel in the efforts to bring them together by sutures; and, when turned into the bowel during such procedure, diminishes its calibre considerably, although it was not demonstrated that the obstruction was ever sufficient to prevent the passage of the intestinal contents. Several efforts were made to get rid of it, and overcome the seeming delay caused by its presence, but all these were finally abandoned.

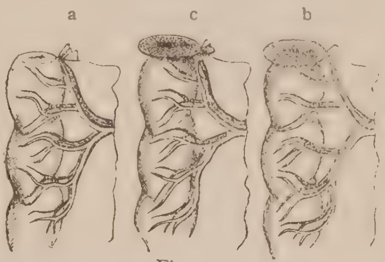

Figure 4.

It was pared away with the scissors; it was dissected up from the other coats for a quarter inch from the edges, but the conclusion was finally reached that instead of being a harm, its presence was useful in giving support, protection, and perhaps vascularity to the freshly sutured edges; at least, in all instances where it was removed, the stitches were found torn out and union defeated; in no instance where it was left entire did there fail to be union in some part, and no sutures gave way when properly applied.

In all instances where a perforation was severe enough to require a resection of the wounded part, it was found advantageous to leave, if possible, a strip of the bowel near the mesenteric junction (Fig. 5, a), taking out the wounded portion by means of a "V" shaped incision. The part left acted as a support to the wound, avoided division of the blood vessels at this point, opposed the action of the longitudinal fibers, and in no instance in which this plan was adopted was there any appearance of separation of the wound or any dis-

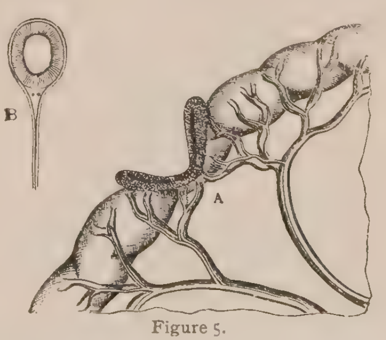

Figure 5.

placement of stitches. In perforations through the stomach, the wound did well after drawing the peritoneal surfaces some distance from the edges thereof, over it by means of the continued suture, thus converting it into a linear wound (Fig. 6, b). The same plan was adopted with success in abrasion and small perforations in the small intestines. (Fig. 6, a.)

This way of treating the bullet openings in the bowel is susceptible of much wider application than would appear possible at the first glance. I am quite well satisfied that it will safely take the place of excision in not a few cases of quite severe injury. The torn edges of the wound can be turned in, and peritoneal surfaces fastened together, even in large wounds, with perfect confidence in the result of safe and secure adhesion following.

It seems probable that by far the greater number of successful cases will follow a single resection, even if that include a number of perforations, and involves eight or ten inches of bowel, in comparison with those cases where several excisions are made of wounded portions widely separated.

Perforations passing through the mesenteric surface of the intestine were found the most difficult to treat, and even if slight seemed always to require a complete excision. A partial excision of this surface of the bowel resulted in an acute-angled elbow which never did well.

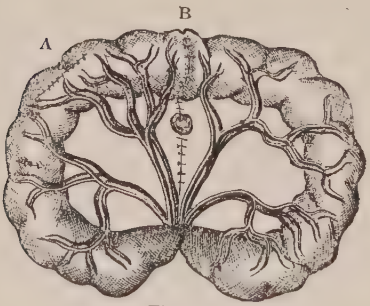

Figure 6.

The point of attachment of the mesentery with the bowel will usually be found the most troublesome to manage, in applying the sutures in restoring a complete division. (Fig. 5. b). It is quite difficult to so place the sutures as to secure a perfect reinversion of the mucous membrane, to bring serous surfaces fairly in contact with each other, and to get a sound junction. The difficulty arises apparently from the manner in which the folds of peritoneum separate from each other before passing on to invest the bowel, leaving a little triangular interval filled with loose connective tissues, fat and blood vessels. Now, if the suture fails to include the muscular coats of the intestine as well as the peritoneum at this point, the junction will urely give way and extravasation result. To make this point secure, the greatest care must be taken in placing at least three sutures (Fig. 5, b), this number being usually quite enough to include the troublesome area, and these should always be the first sutures applied. In placing the remaining sutures to complete the junction after placing the three sutures mentioned, at the mesenteric surface, it assists materially in the ease of application, saves time, and especially avoids trouble from the everted mucous membrane, to apply one at the most convex surface, and then one half way down on each lateral surface. After this is done, the remainder can be introduced easily and rapidly. If introduced in a regular series, one after the other, all the way around, it is a very slow process; the mucous membrane is always in the way, the needle openings in the intestines are apt to be uneven, and it is altogether the poorest plan of proceeding. The advantages mentioned as gained by taking the course suggested, are certainly all of them items of importance, and have some bearing on the result. At best, these procedures will be found very prolonged and tedious. The material used by me for sutures was silk and catgut—the latter for the continued, the former for the interrupted ligatures. No. 1 catgut; No. 2 silk. The needles were the full curved round needle, or ordinary straight sewing needle; the latter is the best. The sutures were introduced about the third of an inch, never less, from the divided edges, made to include the peritoneal and muscular coats, and brought out just free of the edge on one side, and were then reintroduced close to the edge, and made to include about the same amount and kind of tissue on the other side, being *very sure not* to allow the needle to pass into the intestinal cavity. (Fig. 11.) Mr. Howse,* of London, proved conclusively in his cases of gastrotomy, that the fact of entrance of the needle into the cavity of the tube, carrying the thread with it, made the difference between success and failure, cases dying from peritonitis and extravasation when the entry occurred, and recovery following when the thread included only the peritoneum and muscular coats.

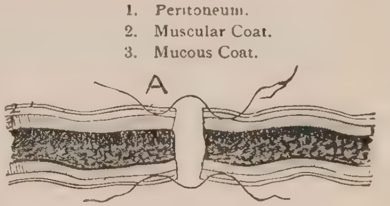

Figure 11.

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* Mr. Howse was the first surgeon to use the double row of sutures for the junction of serous surfaces together. Czerney's suture is an application of it to intestinal wounds. Its use is altogether too tedious, and gives no better result than the single suture including sufficient tissue.

Again, the everted tissue should be turned in before introducing the needle, so that it will pass through the rim of constriction. If entered too far away from the divided edge, too much tissue is turned into the intestine. When the mucous membrane was turned in, and the suture tightened, two broad surfaces of peritoneum were brought in contact. This you will recognize as Lembert's suture (Fig. 6, B), with one change. Lembert directs that only one and one-half line in width of tissue should be taken up by the suture. This amount of tissue will do very well in the closure of small slits, for which it was intended, and to which it was applied; but complete resection needs a much firmer hold to withstand the strain of peristaltic movements. *The fact is, that it makes no difference whatever what kind of suture is used, so that the principle of positively securing the application of two broad surfaces of peritoneum in contact with each other is certainly carried out. Jobert's, Gely's and Czerney's double row of sutures were all given a fair trial,* but none of them resulted as well as this modified Lembert stitch. (Fig. 11, b.) It never failed to be followed by good union when properly applied, with peritoneal surfaces brought together around the entire circumference of the intestine.

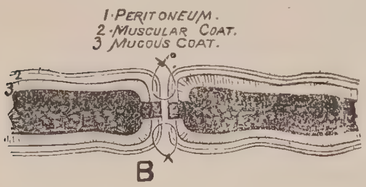

Figure 11.

The greatest number of mishaps followed drawing the sutures too tightly, which, if done, leads to death of the applied edges, and, of course, to failure. They must be drawn only sufficiently close to bring the surfaces fairly in contact; the subsequent swelling from obstructed circulation will hold the surfaces firmly together until glued to each other by the rapidly forming adhesive material.

The interval left by the incurving of the edges of the bowel, immediately after the completion of the operation, was found entirely obliterated, and the sutures covered up by effused lymph at the end of twenty-four hours. In one or two instances, where very small openings had been made in the bowel, they were occluded by passing a suture around the perforation, a short distance from its margin, pushing the wound into the cavity of the intestine, and then by tightening the suture the peritoneum was drawn together over it, a very satisfactory plan of procedure where circumstances will permit its application.

The question of the proper disposition to be made of the divided mesentery, after removal of some length of intestine, is an important one to decide. No plan adopted proved entirely satisfactory. Previous to separation it was ligated in sections (see Fig. 7); the part beyond the ligature is apt to mortify and thus prove a focus for fatal inflammation. The tissue of the mesenteric membrane is not very vascular, and the vitality of the distal portion of the stump is seemingly best provided for by causing it to adhere to surrounding vascular parts.

In some cases the stumps were left free in the abdominal cavity; these all did badly, each showing mortification. In others the different sections were all included in one suture and then stitched to the bowel at the seat of operation, making as nearly as possible a continuous surface of mesentery.

These did much better, there being few instances of sloughing. When sloughing occurred, it seemed to be dependent upon and follow a too tightly fastened ligature. This method above mentioned of treating the divided mesentery is useful in another way: it gives support to the bowel at the point of resection, maintains the intestine in proper position by preventing bending, and also leaves fewer raw surfaces free in the serous sac. This last, a condition acknowledged to be the frequent source of serious trouble from faulty adhesions to surrounding organs, and from furnishing points from which septic absorption takes place.

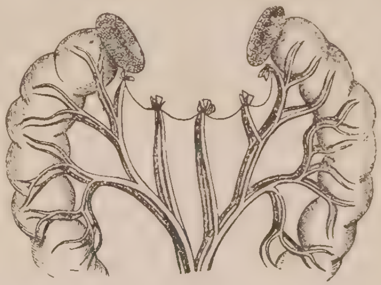
Figure 7.

A plan of dividing and treating the intestine and mesentery has been suggested* to me as a possible improvement on those already noticed. It is really an application of the plan already recommended in single perforations. (Fig. 5, a.) This is to make the separation through the intestinal walls three-eighths of an inch on either side of the mesenteric attachment (Fig. 8), tear away the mucous lining of the retained strip of bowel (Fig, 9), and draw the peritoneal surfaces thereof together by the continued stitch. (Fig. 8.) This would avoid division of the blood vessels going to the bowel, do away with the necessity of using ligatures, and leave no raw surfaces free in the abdominal cavity. The opening formed by the folding together where the bowel ends are united, should be closed by the continued suture. (Fig. 10.) This method was adopted in one experiment with an excellent result.

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*Dr. John Bartlett, Chicago.

Bleeding from slight lacerations of the spleen, kidney or liver, can be controlled by the actual cautery lightly applied, this is perhaps the very best method to adopt. If the wound is a complete perforation of the body of the organ, the hemorrhage is very great, rendering extirpation of the entire organ apparently the only sure way of surmounting the difficulty.

Quite frequently the entire mass of the greater omentum seemed to require removal. The bullet in the transit not only perforated it here and there, but passed along between its folds as well, leaving injured tissue and blood clots of considerable size in its track. These clots disseminated themselves in the meshes in such a way as to entirely prevent their removal without tearing the tissue to shreds. When this condition was present in any degree the mass was amputated, after ligation, in sections. In a few instances these stumps gave rise to trouble, either from recurring hemorrhage or mortification of the distal end.

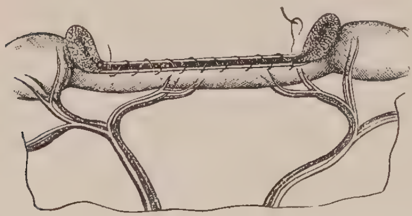

Figure 8.

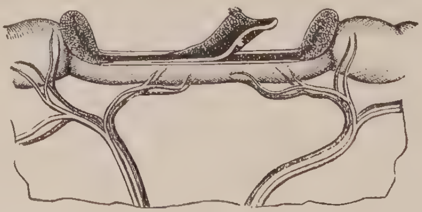

Figure 9.

In the after treatment it was often necessary to administer morphia to secure quiet. Very careful attention must be paid to the amount and kind of food given for some time after apparent recovery. One experiment resulted in failure after the lapse of three weeks from date of operation. The animal was lively, running about as freely as ever, all the functions normal, and the external wounds all healed, when it suddenly sickened and died, having tetanus accompanying rupture of the intestine, several inches

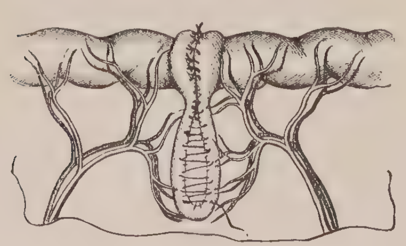

Figure 10.

above the seat of resection. Post mortem examination showed masses of food and grit and greasy cloth, occluding the intestine, and distending it so enormously that rupture was produced; the tube at the seat of the operation was patulous and nearly of usual size. This animal was lost solely through neglect in the matter of feeding. Milk alone was given in all other cases for some weeks after operation. Certainly this is a matter of great importance, and suggestive of the proper care to be given after all such operations. Extreme emaciation occurs during the first week following the operation, and if there is shown any likelihood of recovery, there follows a voracious appetite which should be very sparingly gratified.

The circumstances under which these experiments were done, were such that it was absolutely impossible to carry out full antiseptic appliances. The external incision was treated with iodoform and oakum or absorbent cotton, and with two exceptions healed by first intention.

The bullet wounds through the abdominal walls were not probed nor disturbed in any way. Occasionally, when large and much contused, iodoform was poured on them. In only two instances did they suppurate or give rise to any trouble whatever, crusting over and healing rapidly. This result clearly enforces the rule of not disturbing the track of a bullet through the soft parts unless the most urgent reasons call for interference. The damage of a serious nature is not in the abdominal walls, but in the cavity; the nature of it can be better ascertained and the most satisfactory treatment adopted, after section through the linea alba, rather than by enlargement of the wound of exit or entrance, if any surgical interference be instituted.

In gun-shot wounds of any part of the body, it is not the injured muscular tissue or fascia that causes grave concern, but the torn arterial trunk, or severed nerve, or fractured bone made by the missile, and here, too, incisions out of the course of the bullet track often furnish the best exposure of the parts for manipulation.

None of the wounds of entrance were perpendicular to the surface of the abdomen. All were more or less obliquely directed through the component tissues of the walls, so that they were valve-like in character and tended to close spontaneously. None of these cases presented any extravasation of the contents of the intestines through the external wounds, notwithstanding the lacerations of the tube were often very extensive, and considerable quantities of fæcal matter were found in the peritoneal sac. The conclusion naturally follows, that the discharge of such matters, through the external openings, is not of frequent occurrence after the wounds under consideration. The absence thereof is far from being proof of the non-occurrence of perforation of the intestine.

It can scarcely be expected that extravasation through the wounds in the abdomen will often happen as an immediate occurrence. This is most likely to occur, if present at all, several days after the injury, following adhesion of the bowel to surrounding parts, and the accumulation of a considerable quantity of matter.

There is no reason to suppose that interference with the adhesions to be met with in operations, done some time after the injury, would be followed by any worse consequences than that which follows their disruption during the performance of operations for ovarian or other tumors. The hazard supposed to attend their severance is certainly exaggerated. With a clean cavity they will do equally well in all cases.

These experiments have not developed any data which will aid in the positive diagnosis of the severity, or extent, or kind of injury done to the viscera, or render such diagnosis less difficult than heretofore, previous to abdominal section.

They go a step in advance of this by supporting the assertion that it is absolutely useless to expect immunity from perforations of the intestines when the bullet has traversed the cavity. It seems that it is infinitely more reasonable to subject a patient to the slight risk of an abdominal section, showing unwounded intestines, than to allow him to pass through the fearfully deadly peril of wounded intestines unrelieved, on the barren supposition that they may have escaped injury.

Some uncertainty as to its necessity is likely to arise, except in those cases showing extravasation of the contents of the bowels, or those where the free loss of blood, as indicated by the usual symptoms accompanying such accident, calls for aid. When doubt exists, and a critical condition of the patient argues severity of lesion, abdominal section surely seems to promise relief that can come in no other way. Exploratory incision of the abdominal walls has been done so often, and with so little hazard, as to entitle it to be classed as a procedure in itself almost destitute of danger. Such a conclusion is certainly supported by the results developed during these trials. The rule was, no trouble whatsoever from this incision.

No deduction can more justly or positively follow, as the result of these experiments, than that an incision *de novo*, through the linea alba, is the best method of procedure in the treatment of the class of wounds under consideration; a plan far preferable to enlarging either of the openings made by the bullet. It at once gives command over the entire cavity; therefore, any lesion likely to result in harm is far less liable to be overlooked; it is the least vascular part of the walls; incisions thereof are more easily and perfectly co-aptated than elsewhere, heal readily and soundly, and as a consequence, the oncoming cicatrix is less likely to be followed by ventral herniæ.

Thirty-nine (39) animals were used in these experiments, exclusive of those dying from the effects of the anæsthetic. Two of the thirty-nine were used to demonstrate the effects of closure of the main branches of the mesenteric artery upon the nutrition of the intestines. Of the remaining thirty-seven (37), three cases died immediately after the shot or from the effects of profuse hemorrhage, one having a division of the aorta just below the mesenteric artery; the second had a large laceration of the kidney, with a wound of the renal artery; the third, a laceration of both kidney and spleen. One case, No. 4, had tetanus three weeks after operation, and is given a special position, simply owing to the presence of this condition as a complication in the case. The post mortem examination, as already mentioned, developed other conditions which would have caused death, and which were no doubt the cause of the tetanic convulsions. Twelve of the remaining cases died inside of twenty-four hours, either from severe primary or recurring hemorrhage, and the effects of the very extensive character of the wounds. Two out of this twelve (12) were cases requiring removal of the pregnant uterus, accompanied with many perforations of the bowel; death in both occurred from secondary hemorrhage from uterine stumps—the ligature having slipped. Three (3) more had slight lacerations of the spleen and numerous perforations of the intestine. The spleen was removed and several inches of the tube excised in each case. In three (3) others, from twelve to twenty inches of the bowel was excised, and many arterial trunks severed. One of the twelve (12) had rapid mortification of five or six inches of the entire calibre of the bowel, apparently dependent upon the division of two large mesenteric arteries by the bullet, and also the resection of six inches of the intestine. The remaining three (3) of the number dying inside of twenty-four hours, are classified as having died of shock. On all of them the damage done by the missile was of excessive severity. The bullet was of large size (38 or 44 calibre), and the fire-arms possessing great penetrating and lacerating power. There was not manifested in any case any recognizable evidence of shock aside from that following great loss of blood. The transit of the bullet made no noticeable impression upon the pulse or respiration. In every instance where signs of severe prostration became manifest through change in respiration or weakening of pulse, there was found profuse hemorrhage to account for such condition. I am inclined to infer that the cases are exceptional, indeed, in which purely nervous shock will give rise to symptoms severe enough to mislead one to perform an unnecessary ventral section; rather, when severe constitutional manifestations follow the passage of a bullet through the abdominal cavity, good cause for them will be found, as soon as the cavity is opened, in wounded viscera or blood vessels, and this course will often be the only possible way of either actually saving life or even prolonging it. None of these twelve cases could possibly have lived longer than twenty-four hours after the injury received. Most of them would have died much sooner without the control of hemorrhage, alone made possible by the opening.

Two cases of the series were subjected to the expectant treatment. These cases were chosen because their injuries did not seem very severe; the hemorrhage was not great, and the prostration not extreme. Both died; the first in one day; the other lived five days. Post mortem examination showed extensive extravasation of the contents of the bowel and septic peritonitis.

In one case an attempt was made to establish an artificial anus. The wounded intestine was resected, and the ends fastened to the edges of the abdominal incision. The animal died of septic peritonitis in three days. This trial was made early in the experimentation, before any definite plan of procedure had been settled upon. This is the only experiment that has given rise to any regret, for I feel satisfied that, with a fair junction of the bowel and a clean abdomen, the animal would have been saved.

Eighteen of the thirty-seven (37) have thus far been accounted for; of the remaining nineteen (19), ten (10) died and nine (9) recovered.

The ten fatal cases lived from three days to three weeks. Peritonitis from one cause or another seemed to be the precursor of death. In six of them, mortification of the ligated stumps of the divided mesentery, together with mortification of the edges of the recently united bowel, were present. In the one that lived three weeks, death was the result of intestinal obstruction, caused by the adhesion of a fold of the intestine to the stump of mesentery left free in the cavity. An acute flexure was produced at the point, against which the contents of the bowel had accumulated in large quantity. A rupture was found above this mass, through which extravasation had taken place. The inflammation was so intense that everything was matted together, and the specimen so horribly offensive it could not be preserved. There was no separation at the point of operation on the bowel; it was thicker here than elsewhere; but full distension with water was allowed without leaking. All of these cases demonstrate conclusively the necessity of great care in the manner of dealing with the divided mesentery, and in the application of the sutures which bring the separated bowel ends together. The remaining four furnish evidence of separation of the recently united parts of the intestine at the mesenteric junction. In all of them the thread failed to include the muscular and fibrous coat of the bowel, holding only the peritoneum. The result was extravasation, and death followed.

It may be a matter of surprise to you that the percentage of successful cases presented is so small—nine out of nineteen of those surviving over 24 hours—so few out of so many. To me, knowing well the extremely adverse circumstances under which these experiments were performed, it is a matter of astonishment to have so many recoveries included in so few cases. It is suggestive to remember that all the recoveries followed the use of the modified Lembert method of bringing the peritoneal surfaces together, while in many of the failures, trials were made of other methods. Full six weeks have gone since the last case followed by recovery was subjected to operation. The first favorable case was treated four months ago. None of the animals present evidence of being other than in their usual health. The longest resection of intestine among the recoveries measured over six (6) inches and included four (4) perforations.

It is scarcely possible to do work of any kind under more disadvantageous surroundings than accompanied the performance ot these experiments. The operative work was carried on, and the animals kept in the prosector's room of a medical college during the winter season, in the midst of the odds and ends and bad hygienic conditions of such a place. No better accommodations could be secured. The labor has been purely one of experimental injury, and not a striving after recoveries, implying a choice selection of attending circumstances and special preparations to that end; therefore, I judge it proper and fair to claim the results as satisfactory. These results certainly indicate that a better showing is likely to follow where more satisfactory control can be had over both patients and surroundings than was present during these examinations.

They clearly demonstrate that a hopeful expectation of recovery may be entertained after operation, and suggest the nature of the injuries produced, what accident to avoid, and what treatment to adopt.

My confidence in coming before you with no better record is assured, when I remember that all of you are well aware of the great mortality of these injuries, under all circumstances. It must be large, surely, when Dr. Otis, in the surgical history of the war, says the authenticated cases of recovery can be counted on the fingers of one hand. It cannot be said that operative interference in these cases has as yet an established position. Still, perhaps Dr. J. Marion Sims looked with prophetic eyes upon the future, when he closed the article already referred to with the following words: *"I have the deepest conviction that there is no more danger of a man's dying of a gunshot or other wound of the peritoneal cavity, properly treated, than there is of a woman's dying of an ovariotomy properly performed. Ovarian tumors were invariably fatal till McDowel demonstrated the manner of cure, which has now reached such perfection that we cure from 90 to 97 per cent. of all cases. And by the application of the same rules that guide us in ovariotomy to the treatment of shot wounds penetrating the abdominal cavity, there is every certainty of attaining the same success in these that we now boast of in ovariotomy."

In a rather quaintly-written but richly-laden book on surgery, by Herr. L. Heister, Professor, etc., written in 1739, there occurs this passage:

"When the intestines are wounded but not let out of the abdomen, and therefore the wounds are out of reach, the surgeon can do nothing but keep a tent in the external wound, according to the rules laid down at chapter V, and after this bleed the patient if his strength will admit of it, advising him to rest, eat abstemiously, and lie upon his belly; the rest is to be left to Divine Providence and the strength of his constitution. But the

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*British Medical Journal, March 4, 1882.

question may be asked here whether a surgeon may not very prudently, in this case, enlarge the wound of the abdomen, that he may be able to discover the injured intestine and treat it in a proper manner. Truly, I can see no objection to this practice, especially if we consider that upon the neglect of it certain death will follow, and that we are encouraged to make trial of it by the successes of others. Sacherus, in Programmate Publico, Lipsiæ, ed. 1720, mentions a surgeon who performed this operation successfully."

A period of 100 years and more has rolled away since Dr. Heister published his belief and reported recovery, to the time when Dr. Sims expresses his convictions—over a century of doubts, timidity, uncertainty and gloomy misgivings, lightened only occasionally by some bold and resolute assertions. The future asks for action, and it is not unreasonable to assert that careful trials will acccomplish successful results.

Avoiding any spirit of dictation, it seems proper to tabulate the following conclusions as an outgrowth of the experiments:

First. Hemorrhage following shot wounds of the abdomen and the intestines, is very often so severe that it cannot be safely controlled without abdominal section; it is *always* sufficient in amount to endanger life by secondary septic decomposition, which cannot be avoided in any other way than by the same treatment.

Second. Extravasations of the contents of the bowel after shot injuries thereof are as certain as the existence of the wound.

Third. No reliable inference as to the course of a bullet can be made from the position of the wounds of entrance and exit.

Fourth. The wounds of entrance and exit of the bullet *should not be disturbed* in any manner, except to control bleeding or remove foreign bodies when present. They need only to be covered by the general antiseptic dressing applied to the abdomen.

Fifth. Several perforations of the intestines close together require a single resection, including all the openings. Wounds destroying the mesenteric surface of the bowel always require resection.

Sixth. The best means of uniting the wounded intestine after resection, is by the use of fine silk thread after Lembert's method. It must include at least one-third of an inch of bowel tissue, passing through only the peritoneal and muscular coats, never including the mucous coat. The everted mucous membrane must be carefully inverted, and needs no other treatment.

Seventh. Wounds of the stomach, small perforations, and abrasions of the intestine, can be safely trusted to the continued catgut suture.

Eighth. Every bleeding point must be ligated or cauterized, and especial care devoted to securing an absolutely clean cavity.

Ninth. The best method of treating the stumps of divided mesentery is to save the mesenteric surface of the bowel as above indicated.

Tenth. *Primary abdominal section* in the mid line gives the best command over the damage done, and furnishes the most feasible opening through which the proper surgical treatment of such damage can be instituted. Further, its adoption adds but little, if anything, to the peril of the injury.

Eleventh. Is not the moral effect of the assurance to the patient, that he will be placed in a condition most likely to lead to his recovery, a good substitute for the mental depression accompanying the general and popular conviction that these wounds mean certain death?

EXPERIMENTS ON GUN-SHOT WOUNDS OF THE ABDOMINAL CAVITY.

(Appended to Dr. Parker's Address.)

EXPERIMENT NO. 1.

Wednesday, November 14, 1883—Long, lean and lank setter; about 30 lbs.; in rather poor condition. Etherized with common ether and shot through abdomen with a No. 32 cal. ball, which passed directly through anterior wall to the innominate bones. Upon opening abdomen found ileum perforated about the middle and at the ileo-cæcal valve, and slightly grazed at another point. Extravasation of intestinal contents at each perforation. Some entozoa. The two perforated regions were resected and continuity of ileum re-established by Lembert's intestinal stitch. The grazed portion was closed by continued suture. Intestines washed with a feeble solution of carbolic acid, and returned to abdomen; and the external wound closed by two sets of sutures, one set through muscular walls, including peritoneum, and the other uniting the skin. Drainage tube inserted, and wound dressed antiseptically with gauze, cotton, etc.

Entire operation lasted about one hour, and conducted antiseptically, abdomen being shaved, washed and irrigated with carbolized solution, etc. The animal waked considerably shocked. Gave rectal injection of alcohol and water (1-2 1-2), about 3 drachms, and in half an hour gave 10 drops of laudanum. The dog seemed very bright. At 6 P. M. was considerably weakened; respiration very rapid, with much febrile excitment. About three-quarters of a pint ot warm milk per stomach-tube, twelve drops of laudanum, and about a quarter-grain of morphia hypodermically. Tied him under register well bedded in a large comforter, and covered him with a coat.

Thursday, November 15.—Dog died between midnight and morning. Post-mortem. Abdomen filled with bloody serum and intestines inflamed and badly smelling; kidneys a bright blue, and rectum filled with hardened fæces. Dog had vomited during the night a quantity of hair and some pieces of cartilage, etc. Died of shock, Wounds of intestine well agglutinated.

EXPERIMEMT NO. 2.

Friday, November 16 —The ball (32) severed the aorta.

EXPERIMENT NO. 3.

Saturday, November 17.—(Ball 32 cal.) Dog etherized, shaved and shot very near abdominal margin. Upon opening abdomen (incision 3½ inch), but one loop of gut was found perforated. This was excised, and the continuity of intestine restored by eighteen individual silk stiches, which brought serous surface to serous surface, the greatest difficulty being encountered at the mesenteric attachment to the gut on account of the fat which lay between the two layers of peritonaeum and adherent to the gut itself. Extravasation of intestinal contents. Tape worm.

Wound closed with heavy silk and dressed antiseptically. Gave 15 gtt. laudanum at night.

November 18.—Animal seems bright, but disposed to remain quiet; drinks plenty of water and urinates freely; respiration hurried and febrile action high.

November 19.—Seemed very well, and partook of some milk during morning, but began vomiting in the p. m. a sour, watery and greenish fluid. Gave per rectum about one-fourth grain morph. sulph. at night, and left him sleeping comfortably.

November 20.—Seemed quite lively and comfortable, the dressings having been removed the day before, and a large body bandage applied. About 11 a. m. seemed rather tired, and vomited large quantities of the same sour fluid as before; would not eat meat or drink milk, but drank water freely. Gave about three-eighths grain morph. sulph. hypodermically, and during the p. m. he seemed extremely sleepy and much disposed to lie down flat, but is nervous and easily alarmed by sudden noises, etc., etc. This condition lasted all day, and suppose it is the effect of the morph.

November 21.—Died during night. Post mortem showed a separation of the resection, which had evidently first torn out at the mesenteric attachment. Extensive peritonitis, intestines being agglutinated together and abdomen filled with fluid blood and fæces.

Experiment No. 4.

November 23.—(Ball cal, 32.) Very large dog, weight about seventy-five pounds. Upon opening abdomen, found a section of intestine for about six inches perforated in several places, the ball apparently having skipped along inside the gut; at another place the free edge was shot off, and other portions of the ileum grazed three times. The middle section was resected entirely, and closed perfectly; the shot edge was closed by trimming edge or side of the tube of intestine by a "V"-shaped cut towards the mesenteric attachment, and that also was closed fairly well. This was close to the left end of the pancreas. Each opening showed extrusion of contents. Many worms.

The operation lasted two hours; abdominal wound closed by two sets of sutures, one set through the muscular walls, the other bringing the skin in contact. Wound was covered with cotton, and bandage applied. Gave 20 gtt. deod. tinct. opium and a little water. Seemed to be doing well all p. m., and at night at six o'clock gave about 20 gtt. more of the opium, and left some water where he could get it.

November 24.—Dog still alive and very thirsty, but vomits the water soon after drinking; gave another dose of opium at night.

November 25.—Bandages have not been changed.

November 26.—Changed dressings; dog seems bright. Gave pint of milk; also opium, which he drank readily, but soon vomited. Gave more milk about noon, which he retained. In the afternoon he seemed much weaker. Gave deod. tincture of opium gtt. 20 at night.

Still lives, but is not strong. Lies in any position in which placed, and seems quite prostrated. Opium as before seems to revive nim; he refuses milk, but drinks freely of water, which the stomach promptly rejects. In the afternoon, being no better, removed dressings, and although wound was quite healed, made an opening for medium-sized drainage tube, and let out about a quart of bloody serum; re-dressed the wound after injecting a weak carbolized solution of warm water into abdomen through tube. Gave a rectal injection of alcohol and water (1-2 1-2) warm and gtt. 20 of opium. Is getting very poor, but respiration is regular; pulse very weak and rapid.

November 28.—Gave enema of soapy water very weak. Washed out wound and inserted short drainage tube and fresh bandages. About 11 o'clock had a passage from bowels of a large quantity of black, tarry, and badly smelling fæces, result of injection per rectum. At 2 p. m. was very weak. Gave enema of whisky and milk, warm, about two oz., and made a stew of small bits of beef and milk in whisky, which he ate greedily. Gave milk and whisky per rectum every three hours, also Valentine's extract of meat.

November 29.—Seems much stronger; had a semi-liquid passage from bowels. Gave enema every four hours of Valentine's extract, milk and whisky; and also fed pieces of raw meat in milk.

November 30.—Steady improvement; another passage, which evidently came from above seat of operation. Fed him on raw steak, and gave whisky per rectum every four hours. Sutures through integument have ulcerated their way out; were removed and dog allowed to lick his wound, as he promptly tears off all bandages.

December 1.—Feeding as before, with steady improvement.

December 2.—Another passage from bowels during night. Gave meat, about one-half pound every three hours, which he eats greedily; marked improvement daily in strength and appearance.

December 3.—Same improvement.

December 4.—Sent dog down stairs in basement.

December 10.—Alive and apparently in perfect health. External wound closed completely.

December 11.—Seems sick; refuses to eat; howls at night.

December 12.—Has marked symptoms of tetanus, and is in a state of rigidity with episthotonos.

December 13.—Died, and post-mortem showed an obstruction of intestine by a large mass of meat or a collection of various substances of a gritty consistency which completely obstructed and occluded bowels for some distance. The bowel was opened above this, and abdominal cavity filled with intestinal contents, and organs all adhered, as result of peritonitis; resection wound quite strongly united. Dog died from careless feeding and obstruction following adhesion of knuckle of intestine to omental stump.

EXPERIMENT NO. 5.

Monday, November 26.—(Ball cal. 32.) Medium-sized, well-conditioned and sturdy dog. Shot passed through a six-inch piece of intestine, making several perforations. Much fæcal matter free in abdomen, some opposite each opening. Many tapeworms.

November 27.—Made a resection of but one piece six inches in length, including both wounds. In this instance the larger silk sutures were used. After the continuity of the intestine was restored there was a great deal of bleeding from the interior of the abdomen, the origin of which could not find, but allowing the air to reach into all parts of the abdominal cavity, it ceased after considerable loss of blood. A portion of the omentum being filled with blood, it was ligated and removed. In closing abdominal wound was obliged to tear away a certain amount of fat which was closely adherent to interior wall of abdomen, along the line of the wound, in order to introduce sutures so they would not include the fatty mass. Introduced two drainage-tubes, and applied large pad of cotton. Gave some opium, about gtt. 15. P. M. dog seemed considerable shocked, but was quite thirsty. At night gave more opium.

November 17.—Cotton was soaked with fluid from drain-tubes. Removed dressings, and, upon getting him upon his feet, a small quantity of fluid escaped. In the evening washed out the abdomen with a warm solution of carbolic acid, about ½, and applied dressing of gauze. During the day he vomited considerable milk and water which he had drank, and was evidently very weak.

Gave about gtt. 20 of opium at night. Died at 8 A. M. on November 28. Post-mortem showed that sutures had parted at mesenteric edge, and death was from peritonitis. Mortification of edges of resection.

EXPERIMENT NO. 6.

December 5.—(Ball cal. 32.) Died of hemorrhage, after being shot, from wound of renal arteries, the ball perforating one kidney. Several perforations of the small intestines, all of them showing extrusion of contents. One large round worm free in cavity.

EXPERIMENT NO. 7.

December 7.—Died under ether.

EXPERIMENT NO. 8.

December 7.—(Ball cal. No. 32.) Ball opened one of the mesenteric arteries, and after resecting three pieces of intestine, and closing wound nicely (every perforation showed fæcal matter, worms, etc,); she died in less than nine hours from shock. Great loss of blood; died of loss.

EXPERIMENT NO. 9.

December 10.—(Ball cal. 32.) Gave morphine hypodermically at 9 A. M. Medium-sized female dog. Anæsthetized at 9 A. M., and shot at 9.30, first shot simply going through abdominal walls; second shot higher up and perforating spleen. Operation began at 10.15. Found abdomen full of blood, fæcal matter, and some worms. Removed spleen and large mass of omentum; ligated and removed one piece; resected about three inches in length; perforated in two places. Much hemorrhage; operation concluded at twelve. Gave opium and whisky; much shocked. Died.

EXPERIMENT NO. 10.

A well-nourished bull-dog (female), about twenty-five pounds in weight. Was anæsthetized about 9.15 A. M., and then shaved over the abdomen. Was shot at 9.45 by a 32-100 calibre revolver just posterior to the umbilicus, the bullet entering on the right side about three inches from the median line, the point of exit being in the corresponding situation on the opposite side. On opening abdomen found animal pregnant. There was one wound through the right cornu of the uterus, rupturing the membranes of one fœtal dog, and allowing the escape of the amniotic fluid into the peritoneal cavity. One of the smaller mesenteric arterial branches was cut, and the small intestine perforated in one place. The abdomen contained considerable blood on opening immediately after the shot, and there was slight extravasation of fæcal matter from the gut at openings. The vagina and uterine ligaments were ligated by single carbolized silk ligatures, and the large gravid uterus removed. The hemorrhage in the mesentery having been checked, the wound in the intestine was resected, about two inches being removed. The free ends were united with the interrupted silk ligature. The peritoneal cavity was sponged out and washed with slightly carbolized warm water. The external wound was united with about ten silk ligatures, and dressed with iodoform and gauze, the whole being covered with oakum and bandaged. About half a grain of morphia was administered hypodermically; and at twelve the dog was allowed to come from the influence of ether. She showed marked symptoms of shock, but rallied in the afternoon. She died in the night. Post-mortem revealed hemorrhage from the uterine stumps, and some peritonitis commencing.

EXPERIMENT NO. 11.

A full grown, healthy appearing dog. Etherized at 9:30 a. m. Abdomen shaved and cleansed. Was shot at 10 a. m., still under the influence of ether, the bullet from a 32 S. & W. revolver passing transversely through the lower part of the abdomen. Was placed on table and kept partially anesthetized until 10:45. The animal then presented signs of extreme loss of blood, feeble respiration and heart action, cold extremities, pallid gums, etc. Abdomen was opened by large crucial incision and found to be filled with blood. Bleeding was ascertained to come from a divided mesenteric artery, and was readily checked by ligature. Clots were turned out, and two wounds of small intestine found. But slight extravasation of contents of bowel into the cavity, still some matter and worms found at openings. The intestine was resected at the site of each wound, about three inches being removed in each place. The cut ends of each were then united by about twelve interrupted silk sutures, so placed as to bring peritoneal surfaces in apposition. Intestines were then returned to their place, the cavity sponged out, and the external wound closed tightly with silk sutures. This was finished at 12 o'clock, the dog appearing moribund at its close, and remaining in a condition of collapse for about three hours. Reaction then took place, and he was able to stand and walk about. Second day, took some milk, which was vomited at once. This was repeated at intervals during second and third days. Dressings were changed on third day. No discharge from wound. On fourth day vomiting was increased, and was fæcal in character. Dog too weak to stand. Dressings changed again and wound found to be discharging purulent fluid. Died at 4 p. m. on fourth day. Post mortem showed sero-purulent exudation in abdominal cavity, intestines glued together by adhesive lymph, wounds uniting well, and occlusion of the bowel in the neighborhood of one of them, from its having been sharply folded upon itself, and bound in the position by the inflammatory exudate.

EXPERIMENT NO. 12.

December 27, 1883.—The bullet, 32 calibre, entered the abdomen on a line corresponding to the junction of the anterior and lateral surfaces of the abdomen, just in front of the hind leg, its point of exit on the other side being on the same line a little above the umbilicus.

On opening the abdomen it was found that the lower part of the jejunum was cut in two places within two inches of each other, and that there was considerable blood in the peritoneal cavity from these cut surfaces, there being no mesenteric vessels cut; also fæces and worms.

Both wounds were included in the parts excised, and the cut ends of the intestines were fastened together by three sutures, and then stitched to the abdominal parieties, thus forming an artificial anus.

Considerable shock was experienced, and owing to a desire to hasten the operation, the peritoneal cavity was not as carefully sponged as it should have been.

The dressing consisted of iodoform, protective and oakum. Of tinct. opii. deod. gtts. 20 were given by the mouth. The operation lasted two hours. On the following day he took a little nourishment; there was no tenderness, but some pus was squeezed from the point of exit of the bullet, the dog lying on that side.

Next day about one-half ounce of pus was forced from the point of exit of the bullet, the dog lying on that side, and by turning him on to the other side, an equal amount was obtained from the point of entrance, but there was no suppuration from the wounds themselves.

He took a little nourishment and seemed to be in good condition, respiration being normal and pulse regular. He had a free urination, and soft stools were passed from the artificial opening. He died during the night. Post mortem revealed a large amount of septic material in the peritoneal cavity.

Experiment No. 13.

Saturday, December 29.—(Ball calibre 32.) Medium-sized, middle-aged female dog. Gave with the anæsthetic about three-eights grain of morphia hypodermically after shot. Abdomen found full of blood; seat of hemorrhage found at one of the points of perforation, of which there were two; from these issued fæcal matter, gas and worms, a medium-sized mesenteric artery having been shot off. All the intestines were drawn out of abdomen for examination, and it was found necessary to resect two portions which were a considerable distance apart, both places closing neatly and perfectly. Abdomen washed out and external wound closed by one set of sutures and a large pad of oakum laid over and held in place by roller first, and over all a many-tailed bandage. Gave 25 gtt. laudanum.

December 30.—Dog got loose during night and was running around very briskly; room very cold and disagreeable. (On the afternoon of the day of operation some person had opened the doors and windows and exposed the animal to a strong, cold draft for about two and one-half hours.) In the evening gave hypodermically morphine, when she vomited for first time and seemed very weak.

December 31.—Seemed lively and well all day; gave milk, which she would drink but could not retain. About noon gave an enema of Valentine's extract, and in the evening left a pan of milk.

January 1, 1884.—She seems as well as ever, but the floor of the room was profusely decorated with vomit. The milk was all gone. Gave an equivalent of an ounce of whisky, of alcohol and water per rectum, and left a supply of water as she seemed very thirsty. Bandages changed for the first time since the operation. There had been but little discharge and the wound was in good condition. Applied a large pad of oakum and a wide roller as before.

January 2.—Seems quite exhausted. Gave alcohol and water

(1-2 1-2) per rectum about four or five times a day in quantities of about one ounce; has a diarrhœa and vomits.

January 3.—Diarrhœa continues, but no vomiting. Has some appetite, and gave raw meat (steak) chopped fine, every two or three hours; also fresh milk, which she drinks readily.

January 4.—Seems quite well, and hungry; fed regularly and removed all dressings; wound in good condition. Removed all stitches and did not apply dressing again. Appetite good.

January 5.—Dog is seemingly well; has a voracious appetite. Much wasted in flesh, but appears strong.

January 6, 7, 8.—Fed her upon milk; also meat chopped fine and raw.

January 9.—She seemed well enough to be sent down cellar, where she continues gaining strength and flesh.

January 13.—Is perfectly well. Recovery.

Experiment No. 14.

January 9, 1884.—This dog was allowed some milk a short time previous to the operation, hence his stomach was distended.

The first bullet (32 calibre) grazed the abdominal walls, not entering the peritoneal cavity

The second entered on a line corresponding to the junction of the anterior and lateral surfaces of the abdomen, a short distance in front of the hind leg, coming out a little nearer the median line, and two inches nearer the front leg.

On opening the abdomen it was found there was some hemorrhage, mucous and particles of food in its cavity and on surface of stomach, and that the lower part of the stomach was wounded. the point of exit being two inches from the point of entrance, passing through the whole thickness of the stomach. There was no wound of the gut. The peritoneal surfaces were drawn together with catgut, by inverting the edges and using the continued suture.

Great care was taken in the *toilet de peritonie*. Immediately after closing the external wound he vomited a half pint of blood, mucous and milk. Time of operation was one hour and a half. Then he was given tincture of opii deod. gtts. xx.

The wound was dressed with iodoform, protective and oakum.

On the tenth was given nothing except a little water. On the eleventh he was given a little milk, which caused some disturbance. On the sixteenth the stitches were removed and no dressing applied, there being but slight discharge from the wound made by the incision and none from the bullet wounds. Recovered.

EXPERIMENT No. 15.

Small dog, female, was anæsthetized and shot at 10:30 A. M. (S. & W. revolver, 32 calibre.) First wound passed through abdominal muscles only. Shot again immediately, bullet this time passing transversely through middle of abdomen. Opening made at once by linear incision. But little blood in cavity. All bleeding stopped upon exposure of intestines to air. Five wounds of small intestine found, all showing extravasation of contents. Two resections of five inches each were made to include all wounds. Cut ends were united by a continued catgut suture in each place. Intestines returned and abdominal incision united by silk sutures, after thoroughly washing out cavity by a 2 per cent. solution of carbolic acid. The operation was finished at 10:30 A. M. Dog was laid in a warm place, apparently suffering but little from shock. External wound dressed with iodoform, covered by protective carbolized gauze, tow and a bandage. Animal died in about twenty hours. Was not given any food or medicine in that time. Post-mortem showed some small blood-clots about the wounds in the intestine. No serum or other fluids in cavity, and no signs of peritonitis. Death from shock.

EXPERIMENT No. 16.

A dog of uncertain breed, about twenty pounds in weight, was shaved over the abdomen and anæsthetized at 10 A. M. Was shot in the abdomen in front of umbilicus, the bullet entering on the right side and coming out on the same side about two inches nearer the median line, not entering the abdominal cavity or wounding the peritoneum. Was shot again, the bullet entering on the right side, external and posterior to the first, and coming out on the opposite side, about two inches from median line. The calibre of the revolver was 32-100. Upon opening the abdominal cavity the peritoneum was found to be plowed across between the wounds of entrance and exit, and the spleen to be slightly nicked, the bullet having skirted the abdominal walls, The only hemorrhage was from the external wounds and the spleen and track of bullet. The spleen was removed, its peritoneal toneal connections being ligated by five silk ligatures. The small intestine was resected, about four inches being removed. The abdominal cavity was washed with warm carbolized water. The external wound was sewed up by about ten sutures. The dog came from under the influence of ether at 11:30 A. M. The wound was dressed externally with iodoform and oakum, and fifteen drops of deodorized tr. of opium administered by the mouth. A curious phenomenon was observed upon cutting out the spleen. The stomach and intestine became distended enormously with gas, extruding from the abdominal cavity and covering a large area of the operating-table. They were with difficulty returned with steady pressure. The dog died in the night from shock and hemorrhages from splenic stumps.

EXPERIMENT NO. 17.

January 23.—(Ball cal. 32.) Good-sized coach dog. Bullet passed through abdominal walls without wounding intestines and just entering the peritoneal cavity, as was found after opening abdomen, the point of entrance and exit being on either side of the middle line and five inches apart. Removed the major portion of the greater omentum and also resected about six inches of the ileum and closed the wound by five sutures, the external wound being but two inches long.

January 24.—Seems inclined to be quiet all day; had defecated during the night and urinated very little; drinks but little water, and does not vomit it. Is by nature a very frisky dog, and do not think his extreme quiet very favorable.

January 25.—Seems quiet; no bloating of abdomen; removed bandages; re-applied dressings. Refused milk all day; also water.

January 26.—Gave small quantity of milk in the afternoon; re-applied the dressings which had been removed the day before; found the bullet wounds much puffed up, and that the stitches had slipped in two places, leaving a hole opening into abdomen large enough to admit little finger. The portion of intestine viewed through opening in external wound looked red and inflamed, but not badly so; little running from the wound. Filled it with iodoform and applied pad of oakum.

January 27.—Gave about one-half pound of meat and a quart of milk; seemed to be ready to get well.

January 28.—Fed meat and milk during day, and he seems to be rapidly getting well.

January 29.—Wound gaping, but discharged him to the cellar. Recovered.

EXPERIMENT NO. 18.

January 25, 1884.—This dog, a black and tan bitch, having been shaved the day before, was anæsthetized and shot.

The bullet, 32 caliber, passed directly through the abdomen about its middle, piercing the gravid uterus in two places, and cutting the gut longitudinally. No large vessels were cut. The uterine attachments were ligated *en masse* and the uterus removed. Contents of bowel found at site of wound in intestines.

During the time that an excision of the gut was being made, a profuse hemorrhage occurred from the uterine stumps, before they could again be ligated by passing a suture through and ligating one-half at a time, the animal was almost exhausted from hemorrhage.

The excision of the gut was then completed, and the cut ends stitched together with silk. The peritoneal cavity was then thoroughly washed out with slightly carbolized warm water, and the external wound closed. The dressing consisted of iodoform, gauze and oakum.

Of tinct. opii. deod., gtts. xx were given. Death occurred within ten hours after the operation, from effects of the hemorrhage.

EXPERIMENT NO. 19.

Dog was full-grown and apparently healthy. When the abdomen was exposed by shaving, two small abscesses, each the size of a filbert, superficially seated and non-inflammatory, were discovered. They were not disturbed. The animal was anæsthetized at 8.30 A. M., and at once shot through the middle of abdomen with a 44 caliber revolver. The dog was placed upon the table, and a linear incision of about three inches made in the median line. It was there found that the ball had glanced upon the abdominal muscles, and instead of going through the mass of small intestines, had been deflected so that it just entered the peritoneal cavity beneath the linea alba, traversed the cavity for about an inch, producing a contused wound of a fold of intestines, and then entered the abdominal parietes to make its exit opposite the wound of entrance, about two inches from the linea alba. Only a small amount of blood was found in cavity. Although none of the intestines were wounded, a resection of about two inches from the middle of the ileum was made. The divided ends were united by about a dozen interrupted silk sutures. The cavity was washed thoroughly with a 1 per cent. sol. of carbolic acid, the intestines returned, and stitches were being placed in external wound, when the abdominal cavity was found to be filling with blood. Source of the hemorrhage was found to be a branch of mesenteric artery at the site of the resection, which had commenced to bleed as soon as circulation was restored by warmth of abdomen. A ligature was applied, the intestine returned and the cavity again thoroughly washed out. The external wound was now closed by silk sutures, the wound dusted with iodoform, and dressed by applying a few thicknesses of carb. gauze, covering this with a mass of tow and a bandage over all. Animal appeared to suffer but little from shock. On morning of second day was given ¼ grain morphia with 1-100th grain atropia by the mouth.

On the third day appeared greatly prostrated, vomited at intervals, and a muco-purulent discharge was noticed coming from nostrils and eyes, Vomiting ceased on fourth day. Prostration and evidence of fever kept up to the morning of fifth day, when improvement began. Discharge from nostrils continued about ten days. On the fourth day a small quantity of milk was taken and retained. Loose discharge from bowels on fifth day slightly colored with blood. A rectal injection of alcohol and water was given on the sixth day. Dressings changed for the first time on sixth day. Wound appeared healthy and united in its deeper portions. Some pus from superficial part of wound from this time on, the dog ate milk regularly, and had regular normal passages from bowels. On ninth day sutures were removed from external wound, which had entirely closed. On the thirteenth day, February 10, 1884, dog is apparently perfectly well; has been eating regularly of raw beef, and has begun to gain in flesh. On the evening of thirteenth day dog was well. Recovery.

Experiment No. 20.

February 2.— (Ball cal. 32.) Died from ether before any incision was made.

EXPERIMENT NO 21.

A strong black dog, about 20 pounds, was shaved over the abdomen and then etherized at 9:15 a. m. Was shot with a 38-100 calibre revolver through the abdomen about opposite the umbilicus, and five inches to the right of the median line, the point of exit being in a corresponding situation on the opposite side. Upon opening the abdominal cavity such a large amount of blood was found that it was necessary to enlarge the incision by a cross cut. A large mesenteric artery was found to be cut and was ligated. Another smaller one was treated in the same way. There were two wounds in the small intestine close together, about six inches intervening between them. Extravasation of contents of both. One was perforating and the other nicking the gut on the mesenteric side. Eight inches were removed, and the free extremities of the intestine united by interrupted silk sutures. There were three other wounds nicking the intestine which were sewed in the same manner without resection. The end of the cæcum, which is peculiarly shaped in dogs, was shot off. Stained mucous and some shreds at the opening, This was sewed, turning the cut end in. The spleen was cut in one place, which was left with one deeply-planted suture. A large fold of omentum was ligatured and removed. The abdomen was thoroughly washed with carbolized water, and the external wound united with about fifteen sutures. It was then dressed with iodoform and oakum, one-half ounce of alcohol and 15 gtts. of deodorized tincture of opium were administered per rectum, and at 12:15 the dog was allowed to come from the influence of ether. The same amount of alcohol and opium were administered as before at 6 p. m. The dog died during the night. Post mortem revealed no evidence of inflammation, and some slight bleeding from the spleen. The sutures in the intestine were in good condition. The piece of gut, about eight inches long, supplied by the mesenteric artery, which was cut by the bullet, was found to be completely mortified.

EXPERIMENT NO. 22.

February 12, 1884.—(Ball cal. 32.) Brindle bull dog. No attempt to sew up the holes in the intestines, of which there were about twenty. Died the day following. "Tilley's anæsthetizer." Every opening showed evidence of extrusion of contents.

EXPERIMENT NO. 23.

February 28, 1884.—Tilley's anæsthetizer. Died before operation from effects of ether.

EXPERIMENT NO. 24.

February 28, 1884.—(Ball cal. 44.) A short, strong Spitz dog. Bullet wounds of entrance and exit four inches apart. Intestine perforated in four places and abraded in one spot. Intestinal worms free in abdomen. Tape worms protruding from perforations.

Extravasation of contents of the bowel. No arteries divided by bullet. Resected one piece (including three perforations) 12 in. length. Removed a V-shaped piece including the fourth perforation, and inverted the serous surfaces by interrupted sutures, the same as in complete section. The apex of the V (pointed to the attached border of the bowel) controlled the oozing from the abraded spot by small suture passed across mesenteric side of abrasion, the abrasion being the size of a copper cent, and on the side of intestine. Washed the intestines and abdomen cavity as clean as possible by stream of weak carbolized and pretty warm water from the irrigator; closed abdomen wound by five deeply-placed sutures about one-third inch apart; gave hypodermic of one-fourth grain of morphia. Shock and little loss of blood. Omentum also removed.

February 29.—In morning seemed very lively and bright; gave some water, which was immediately rejected by stomach. During morning vomited foul-smelling fluid and two large chunks of meat. About 10 a. m. gave hypodermic of one-half grain morphia; in very few minutes he laid down and began to whine as though in pain, and threw up large quantity of offensively-smelling fluid. Died about 3 p. m.

Post mortem.—Abdomen showed evidence of intestinal extravasation, all organs being bound together by peritoneal inflammation; extravasation of blood beneath peritoneal covering of intestines, and small clots adherent all along the length of ileum. The stumps of ligated mesentery and omentum were black. The seat of the operation showed adhesion of the serous surfaces, and water could be forced through the excised piece which was taken out by a cut six in. to each side of the stitches, without any leaking at seat of operation. The spot of abrasion was swollen and blue, and there had been a little hemorrhage from it, The intestines generally were contracted, glued together and pressed into prismoidal and other shapes. Stomach empty.

EXPERIMENT NO. 25.

February 28, 1884.—(Ball cal. 44.) "Tasso."

Bullet under skin opposite to point of entrance. Intestine riddled in about four places, for which a complete section 20 in. in length was removed and was nicely adjusted; another hole in the ascending colon was closed on each side by the continuous suture; the tip of spleen being shot off, to arrest hemorrhage a ligature was passed around proximal side of wound tight enough for that purpose, but yet not enough to cause death of the spleen tissue beyond ligature. The stumps of ligated mesentery being gathered upon a suture, were united to intestine near or about at the seat of the approximation of the divided ends; omentum removed; gave rectal injection of alcohol and water ½ ½ about. Each opening in bowel had more or less of the contents around it.

February 29.—Seemed very quiet all the morning, and was quite indisposed to move. Towards noon, gave him, about 11 o'clock, about 1 oz. of alcohol and water ½ ½ per rectum and some water to drink. which was at once vomited. Seemed very tired all day and disposed to lie stretched out before the heat of the register, and his breathing was entirely thoracic and by means of the cervical muscles. At 6 P. M. gave hypod. of morph. gr. ⅜ and left water where he could drink.

March 1.—Seemed very weak all day; gave hypod. of morph. ½ gr. twice, the last at night. About noon gave rectal injection of alcohol and water.

March 2.—Still alive, but very cold; listless and indifferent; gave morph.,in A. M. and tied him up in blanket. Returned at nine P. M. and poor "Tasso" was in rigor mortis. I think the exposure to cold during the day (Sunday) which was a very wintry day, was in a great measure the cause of his death. He refused to drink any milk during the day, and also seemed to have lost his thirst for water.

Post-mortem March 4.—Extensive peritonitis present; no separation of the united intestine to be found at the seat of operation.

Experiment No. 26.

March 3.—(44 cal. cartridge.) Large, fat and old bitch. Used Frank Gould's revolver, 44, and upon opening the abdomen, found four large rents in the intestines (every one of which showed extrusion of contents and some worms) at a considerable distance apart, and a very profuse hemorrhage from the wound of exit, which was not discovered until the resections were made, of which two included the wounds in the gut, which was about shot off, and much bleeding took place before they were found and ligated. The animal was so fat and boggy that it was with the greatest difficulty that hemorrhage could be controlled. The beast was old and presented signs of cataract in both eyes. The bladder was greatly distended, and the structure of the intestines themselves seemed "sleazy" and the sutures tore out with readiness upon slight traction. Cleansed out abdomen as best we could by thorough washing, but a little bleeding was going on when the wound was closed in the abdomen, and the operation given up as a bad job of one-half hour's duration.

March 4.—Found dead.

Experiment No, 27.

March 4.—(44 cartridge.) Medium-sized dog; died from shock on night of 4th.

Experiment No- 28.

March 6.—(Ball cal. 22, revolver.) Very small, black and tan dog. Shot him with a 22 cartridge, and had to use three shots before could get a good perforation and but little bleeding. Resected a piece around the bullet-hole of ¾ inches long, cleaned abdomen and closed tightly; gave morph. gr. ¼.

March 7.—Seemed very bright.

March 8.—Gave little milk and morphia in evening.

March 10.—Milk.

March 11.—Sent down cellar to be fed on milk.

March 12, 13.—Very hearty, and eats ravenously of milk and very little meat.

March 14, 15;—Doing nicely, Recovery.

EXPERIMENT NO. 29.

March 6.—(Ball cal. 44.) Large, strong dog. Used 44 cartridge. Found the abdomen full of blood, spleen perforated, and intestines wounded in three or four places. From these issued fæces, gas, etc. Removed spleen, omentum, and resected about 12 inches gut, including all the holes but one, which was sewed up by continuous stitch. The animal having lost nearly all his blood by this time, and as death was sure to ensue, one of the mesenteric arteries was ligated to ascertain results.

March 7.—Found dead in morning.

Post mortem.—Intestine black, but the animal had evidently not lived long enough to get any positive mortification of ligatured part, or any interesting appearance at all.

EXPERIMENT NO. 30.

March 10.—Tilley's Inhaler. Large chandler bitch. Killed by ether.

EXPERIMENT NO. 31.

March 10.—Tilley's Inhaler. Large Hastman dog. Killed by ether.

EXPERIMENT NO. 32.

March 10.—(Ball cal. 22, rifle.) Medium-sized bitch. Found three mesenteric arteries severed, and intestines riddled in many places and far apart. Perforations showed fæcal matter and tapeworms. Stopped bleeding and returned intestines without closing the perforations, and closed abdomen. No dressing but iodoform (C. T. P). Spleen also removed, being perforated.

March 11.—Still alive, and sent down cellar.

March 13, a. m.—No better.

March 14, 15, a. m.—Vomiting, and refused food.

March 18.—Dead. Peritonitis septic. Pockets of fæces.

EXPERIMENT NO. 33.

March 10.—Small dog (yellow). Shot with 22 calibre rifle. Three perforations of small intestine, showing fæcal matter.

Removed a four-inch piece in two places, and brought ends together very closely; stitched mesenteric stumps to attached border of intestine. Removed omentum, tying tightly, and also putting in three side stitches, connecting sides of stumps on each side of ligation with one another.

March 11.—Alive, but feverish and vomiting.

March 12.—Died. Separation at seat of operation, and stumps mortified. See specimen. Fæcal extravasation.

Experiment No. 34.

March 12.—(Ball cal. 22 rifle.) Old, mangy bitch. Died under ether. Tilley's Inhaler. Perforation showed extravasation of contents, fæcal matter and worms.

Experiment No. 35.

March 12.—Medium-sized, short-haired, yellow cur (white nose). Shot with 22-ball rifle. Upon opening the abdomen, found blood flowing from a rent in the side of spleen. This organ was three times the normal size, but no holes in the intestines anywhere, and no hole could be found in the abdominal wall on either side. The bullet lay next the abdominal muscles, and was cut out from the wound of entrance. Free bleeding from the laceration in the spleen, which was controlled by a continued suture. Resected six inches of intestine and closed abdomen. Also omentum removed. Iodoform and oakum dressing; gave morphia.

March 13.—¼ gr. morph. A. M.; very weak P. M.

March 14.—Morph. A. M.; very weak P. M. Temperature 102.

March 15.—Re-opened, but found intestine in solid mass and filled with badly-smelling fluid. Washed out as best I could and reclosed. Seat of operation showed mortification on one side, and stumps mesentery also were black and soft.

March 16.—Still alive. Morph. gr. ¼.

March 19.—Dead. Found intestinal worms in abdominal cavity.

Experiment No. 36.

March 12.—Short, black, stumpy and very fat dog. Fired four 22-balls at the animal before was sure that any had entered.

Found abdomen full of blood; two perforations five inches apart, and two mesenteric arteries shot off near the gut. Each perforation showed extravasation, fæces and worms. Ligated the arteries; resected one piece, including both holes; sponged out abdominal cavity; removed omentum, also a large quantity of fat which hung to the inner wall of the belly, and closed wound. Iodoform and oakum dressing; gave morphia.

March. 13.—Quite bright. Morph. A. M. and P. M.

March 14.—Dead. Post-mortem. Found considerable peritonitis and mortification of the ends of the intestines where they were stitched together. The stumps of mesentery and omentum also showed signs of mortification.

EXPERIMENT NO. 37.

March 13.—Medium-sized brindle bitch. No. 22-ball rifle Resected one piece six inches having two holes; removed omentum very little; hemorrhage; gas and fæces from wounds; temperature 98 2–5 at close of operation.

March. 14.—¼ gr. morph. A. M. Temperature 102 2–5. Morph. P. M.

March 15.—¼ gr. morph. P. M.; temperature 102 2–5.

March 16.—Morph. P. M.; temperature 102.

March 17.—Gave milk and morph. P. M.

March 19, 20.—Gave milk and morph. P. M.; seems well.

April 22.—Perfectly well; recovery.

EXPERIMENT NO. 38.

March 13.—Medium-sized yellow dog (with bare spot on tail). No. 22-ball rifle; found one lateral hole which closed by continuous suture, and three holes which were included in one piece which was cut in half by mistake; two arteries gave some bleeding, but were ultimately controlled. Contents of bowel found at each wound. Abdomen closed while yet there was some oozing from the wound, which ceased when bandages were applied; omentum removed.

March 14.—Very weak and much prostrated. Refused to lie down, and can stand with difficulty on his feet. Gave morphia ⅜ hypodermically, morning and evening.

March 15.—Found dead. Post-mortem. Mortification at seat of operation, and escape of intestinal contents.

EXPERIMENT No. 39.

March 14. (Ball 22-cal. rifle.) Medium-sized brindle dog (wolf face); found three ragged holes. Resected one piece which included all openings, the piece being seven inches long; closed neatly, the omentum being removed also (many tapeworms and considerable fæcal matter from openings), then washed clean by irrigator. The entire ileum was inspected and sponged off, and returned to abdomen. Spleen also pulled out and inspected; gave morphia and dressings of iodoform and oakum.

March 15.—Some shock; morphia.

March 16.—Morphia P. M. only.

March 17.—Morphia P. M. only.

March 19.—A. M. morphia, stercoraceous vomiting, and seems very sick; P. M. is evidently dying.

March 20.—Vomiting has stopped, and seems much better Died in the evening. P. M. Septic peritonitis. Post-paritoneal abscesses.

EXPERIMENT No. 40.

March 14. 4.45 P. M.—A young black, bitch pup; anæsthetized and abdomen opened without shooting; ligated a mesenteric artery and closed wound to be re-opened to-morrow P. M. and resect the part supplied by ligated vessel; gave morph. ⅜.

March 15.—Opened her at 3 P. M. in presence of Prof. Parkes. Intestine supplied by the ligated artery seemed softer than normal and its mesentery showed inflammatory exudate considerable effusion; closed wound, gave morphia at night.

March 16.—Gave morphia, gr. ¼.

March 17.—Sent down stairs.

March 19.—Seems quite well.

April 22.—Perfectly well. Recovery.

EXPERIMENT No. 41.

March 19.—(Ball 22-cal. rifle.) Medium-sized young bitch (black). Found one abrasion which closed up by continued suture and the intestine in another place was about shot off; fæcal matter scattered all about, worms divided; resected the piece about one inch long; irrigated the abdominal cavity; removed omentum and then found a hole or rather the tip of the spleen shot off which bled some and was controlled by two interrupted sutures; gave morphia, gr. ¼, and applied dressings.

March 18, 19.—Morphia, gr. ½.

March 20.—Seems bright, but very quiet.

April 22.—Quite well. Recovery.

EXPERIMENT NO. 42.

March 19.—Twenty-two ball rifle (brindle, white bitch,) Found one abraded edge and one hole through free edge of ileum, from which contents issued. Closed one by continued suture and resected across the hole by cutting out a ¾ inch piece. Did not remove omentum. Gave morphia ⅜ and applied dressing.

March 18 and 19.—Morphia. Seems to have a paralysis of left fore-leg since operation and for two days past seems to be salivated.

March 20.—Better.

April 22.—Well. Recovery.

EXPERIMENT NO. 43.

March 20. (Stub tail.) A small half-breed terrier dog. Twenty-tow ball rifle. Found two perforations and one abrasion, extravasion of gas and stained mucus and shreds of matter from openings going through mucous coat. Made a resection including all three wounds, the excised piece being six inches long, closed very snugly and connected the ligated mesenteric stumps with the attached border of intestine by a single ligature passing through both stumps (but two sets of vessels having been ligated) and both sides of the mesenteric borders of the united ends of the gut; removed omentum and irrigated abdominal cavity freely with a 1 per cent. of carbolic acid solution. Dressings, oakum and iodoform; gave morphia, ¼. Recovery.

EXPERIMENT NO. 44.

March 20.—A young, shaggy, cur dog opened without shooting. and ligated three sets of branches from the superficial mesenteric artery, close to the main artery, and also a good-sized anastomatic connection with an adjoining vasa intestine tenuis, which ran parallel with and along the attached border of the bowel. The intestines supplied by the vessels blanched immediately. Closed abdomen; gave morphia, gr. ¼; applied dressings. Recovery.

Died subsequently from ether during examination as to result of above operation six days after it. Found intestine perforated by stick of wood four inches long, rolled in twine. Had removed it. and was about to sew up wound when ether killed him.

Experiment No. 45.

March 20.—A good-sized spaniel dog (old). Stopped breathing once from ether before shooting. Shot with a rifle twenty-two ball. Found the abdomen full of blood, two arteries having been shot off and the ileum perforated in four places; from each contents extruded, two being so near together and the wound so great as to almost carry away an entire segment of the bowel, necessitating a removal of about twenty inches. Much bleeding, which took about half an hour to control, being from the ligated stumps and bullet wounds; the tissues were very brittle, and so loaded with fat as to make the operation difficult. Died in one half-hour after closing abdomen wound.

Pathological Specimens Shown.

First. Section of ileum made 24 hours after operation, showing the sutures all covered with exudate. Union sufficiently firm to allow distention with water without leaking.

Second. Sections of intestines made four, six and eight weeks after operation—the animal having fully recovered. The union is firm and solid throughout entire circumference of the bowel. No narrowing of tube, or disposition to formation of a stricture. Two of the specimens show several of the sutures ulcerating into the lumen of the bowel.

Third. Several specimens showing mortification of distal ends of stumps, and also mortification of applied edges of the bowel from tight sutures and ligatures.

Fourth. Several specimens showing giving way of sutured bowel ends at the mesenteric junction, allowing extravasation causing fatal inflammation—sutures failed to include the muscular coat.

Fifth. Specimens showing many varieties of wounds produced by the bullet.

A Review of Some Facts Connected with Gun-shot Wounds of the Abdomen, and Practical Deductions Therefrom.*

The object of this contribution to the subject of gun-shot wounds of the abdomen is to pass in review such facts as are at our disposal in its consideration, to make such deductions from these as their limited number will afford, and to offer some suggestions based on personal experience.

Probably no question submitted to the consideration of surgeons has ever arrested the attention of the profession more promptly than the general question of surgical interference in penetrating gun-shot wounds of the abdominal cavity, and it is at once remarkable, and to the honor of the profession, that the obvious deductions have been as promptly applied.

Up to 1885 the whole number of recorded operations for gun-shot wounds of the abdomen that I have been able to find is six; by this is meant cases in which the surgeon has deliberately sought out the wounded intestines, and repaired the damage inflicted, in accordance with surgical principles.

Surely a small number in view of the wars which have gone by, contributing and bringing under the surgeon's care, great numbers of these injuries under consideration, and the many individuals shot through the abdomen in brawls of civil life, also placed under medical supervision.

Up to 1885 the profession had not looked the real question square in the face; surgeons held uncertain opinions, with the large majority opposed to any interference whatever, and, as might be expected under such complicating conditions, the results were not brilliant. Operations previous to three years ago were the exception. The magnitude and importance of the subject seemed not to be realized.

Now, I would venture the assertion that there are few modern surgeons who, confronted with a bullet wound of the abdominal walls and not able to convince themselves that the ball had not effected a penetration, but would explore the cavity.

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* Read before the Surgical Section of the Ninth International Congress, September 5. 1887.

When in the winter of 1884 I reflected on the necessity of systematically and experimentally studying this subject, I did not anticipate that in so short a time such radical change would take place in the method of treating such cases, which previously had been relegated to cure by opium, rest and hopes in Providence.

The results of my observations were published in the *Journal of the American Medical Association*, 1885; they were the observations and outgrowing deductions from a series of experiments systematically carried out during the previous winter for the purpose of throwing light upon the pathology and treatment of these iujuries, and of recording the clinical facts attending shot wounds of these organs.

Since the publication of my address to the American Medical Association in 1885, thirty-six cases of operative interference in gun-shot wounds of the abdomen have been recorded, with nine recoveries following opening of the abdomen, suturing the wounded intestines and treating other complicating injuries.

Sir William MacCormac in the Annual Oration delivered by him May 2, 1887, before the Medical Society of London, has collected from all sources thirty cases. To these must be added one case reported by Prof. McGraw, of Detroit, of double perforation of the ascending colon, exposed by enlarging the surface wound, and suturing the intestinal perforations; recovery following. Another, by Dr. J. B. Murphy, of Chicago, of shot wound of the liver, in which the abdomen was opened, blood clots removed, and the wounds sutured; recovery following. Also a death, reported by Dr. J. B. Murphy, from post-peritoneal hemorrhage; post-mortem showing the intestinal wounds to have been safely sutured. One other case of recovery is reported by Dr. J. J. Skelly, of Potomac, Ill., and two fatal cases coming under my own care, to which further reference will be made in this paper; in all thirty-six cases, with nine recoveries.

A reference to the extended reports of these cases, or to the tables of Sir William McCormac, shows plainly that there has been no selection of favorable conditions; that the operations have been done under a great diversity of surroundings, without special assistants, and in many cases with injuries the fatality of which it seemed impossible to overcome.

These results furnish the greatest encouragement for further trials in saving the lives of persons so certainly condemned to death, unless relieved by operation, when suffering from the wounds under consideration.

Every case, whether of recovery or death, following operation should be published in full, so that our experience may be increased, the nature and character of these wounds better understood, and definite rules of procedure elucidated. We might in this way be able to set aside those cases, which from the special character of the wounds will necessarily prove fatal. With our present limited knowledge of reliable symptoms, all is uncertain with an unopened abdomen. Gradually we may be able to positively recognize these cases which possess "a faint hope of relief" to be followed by a good percentage of recoveries after operation. Where to draw the line, and what to do, when operation is decided upon, and how best to carry out the necessary manipulations, are the questions which the future must settle.

Judging from the valuable papers of Drs. Bull, Dennis and Bryant, of New York City, Dr. Tremaine, of Buffalo, Dr. Nancrede, of Philadelphia, Dr. Senn, of Milwaukee, Dr. Marcy, of Boston, Genl. Hamilton, of Washington, Sir William MacCormac and others, and from the expression of opinion, published as coming from the surgeons present at the last meeting of the American Surgical Association, it is certainly just to claim, that the belief that surgical interference in proper cases is the accepted course to pursue is rapidly being adopted by the profession at large.

To me this is a great victory gained. The method of procedure has been tried; and notwithstanding the crudest of data to build upon—the deficiencies in practical experience in man; with propositions already made not thoroughly tested, or perhaps only superficially studied, with the dimest of light for a guide, the results have been remarkably good.

What interferences are justifiable from an external gun-shot wound of the abdominal walls?

A single wound of the abdominal walls, in so far as it affords any inference at all, from its being single, furnishes a hope that no penetration of the peritoneal cavity has taken place, but it is merely a hope.

The resistance of the walls and viscera, though considerable in every case, varies greatly. Consequently, a bullet, although not having momentum enough to make an exit, may have force enough to do much damage among the viscera. Or its momentum may be so slight, and its direction so oblique, as to cause it to remain between the planes of the abdominal walls. Even the existence of an entrance and exitwound widely separated is not always a proof of injury to the viscera. Observations have shown, both on man and the lower animals, that a bullet may enter the abdominal walls at one point and reappear at another, at a considerable distance from the first, and yet not enter the abdominal cavity. If penetration be present with only a wound of entrance, it suggests that the firearm used might have possessed moderate penetrating force, that the velocity of the bullet may not have been extreme, and that the damage done by it is very likely amenable to treatment, with fair prospects of relief.

If there exists a continuous track of tenderness, especially if accompanied with slight redness, from the wound of entrance for some distance over the abdominal surface, it is fair to infer that the missile has wormed itself between the layers of the abdominal walls, and that penetration does not exist. This was plainly shown in a case seen in 1886, and reported by myself in a paper read in New York that year.

The peculiar appearance presented by the edges of the wound, and its size, when carefully studied, will furnish pretty reliable information of the size of the bullet, and its direction of impact, both items of considerable importance in estimating the possible damage.

Bullets from firearms of large calibre are the most destructive to the opposing tissues, and have the maximum penetrating force. A large bullet hole argues a large bullet, certainty of penetration, and large destruction of tissues and organs.

Powder marks on the clothing or body prove a close body shot, and hence greater probability of complete penetration of the abdominal cavity, with wounds to the viscera; and this is true, no matter what may be the calibre of the firearm used.

If the edges of the skin perforation are equally stained throughout and clean cut, the fact suggests that the bullet struck perpendicularly to the surface upon which the wound is found. Again, if these edges are unequally stained, if unequally ragged, or if the surrounding surface shows a stain, or abrasion, or discoloration leading to some portion of the edge of the perforation, all these facts suggest valuable information as to the probable course of the missile in its transit through the abdomen, and the conclusion is justifiable that the impact was not perpendicular to the surface, and, of course, in proportion as the course of imact departs from the perpendicular, the greater is the probability that penetration of the cavity has not occurred.

Naturally, one of the most important items of estimation is to determine the probable course of the bullet in the injuring body. To this end information as definite as possible must be obtained as to the direction from which the shot came, and the distance from which it was fired; both facts having great bearing on the organs wounded, and the damage done them. It is no easy matter even with very complete data to guide one, to feel certain as to the direction of the missile inside the cavity, when there is only one wound. A great many cases will furnish no corroborative information; the surgeon will be compelled to depend upon the signs belonging to the wound itself.

If in doubt as to penetration, the wound should be enlarged by an incision directly through the skin perforation in some chosen direction. By carefully following the track of discoloration left in the tissues by the bullet, not only the fact of penetration or non-penetration will be positively determined, but its directness or obliquity through the abdominal walls, will furnish positive information as to the course of transit of the entering body. With the usual precautions this incision will not increase the patient's danger, even if central section becomes necessary; it throws valuable light upon subsequent requirements, makes clear the fact of penetration, or non-penetration, and. in some situations. may enable the operator to repair all the damage done.

The presence of a wound of entrance and exit, produced by the firearms and missiles of the present day, especially if the shot is delivered in close proximity to the body, with scarcely an exception possible, indicates injury to all the fixed organs lying in the estimated line drawn between the two external wounds made by the missle. Moreover, it is highly probable that the small intestines are also damaged, although these latter wounds may be found some distance away from the line of the ball, their changed position being dependent upon the extreme mobility of the viscera at the time of the receipt of the wound, and from the movements of the body subsequent to the passage of the bullet or other causes.

The great majority of double wounds tell positively of complete and direct perforation and damage, more or less severe, to every organ in their path, there seems scarcely any probability of deviation from their course, caused by the resistance of the soft tissues of the body.

Whether wounds in organs (as contended by Prof. McGraw), found some distance away from the line of transit of a bullet, are to be explained by the elasticity and mobility of the tissues, their constant change of form by inherent contraction, enabling them to get in or out of the way, or by subsequent change induced by weight of the bullet or movements of the body; or, as contended by myself, are sometimes dependent upon an erratic course of the latter, from deviations in its line of flight, caused by deflections therefrom. through impingment on tissues of different powers of resistance or elasticity. is a matter that must be settled by an appeal to physical laws through experimentation; it will never be settled by assertions or assumptions. I am fully convinced that the time does come in the "life" of a flying bullet when its velocity and power of penetration bear such a relation to the power of resistance of the different tissues in the abdominal walls and contents, that the softest of these, touched in a certain way, will deflect its course. In no other way than through this supposition have I been able to explain the character and kind of damage I have seen done by a bullet in its transit through the body.

My conclusions and deductions, on the course of a bullet, are based mainly upon the results of experimentation, during which the animal was profoundly anesthetized, and consequently muscular contraction and activity abolished. If the ball deviated at all from a straight line, there was nothing else to cause the deviations but the soft tissues in its track.

The situation of the wounds will, of course, call attention to the likelihood of damage inflicted upon the organs, in the probable course of the bullet. The severity of the injury and gravity of prognosis is surely greatly enhanced if the movable viscera are wounded. It is much less if only fixed organs are hit. In both the absolutely necessary manipulations by the surgeon, required for the repair thereof, will be suggested, and due preparation to meet all indications can be provided for. There is no opportunity to hunt up necessary appliances after the operation is begun.

An antero-posterior shot below the level of the umbilicus and well toward the lateral surfaces of the body, will be very likely to miss the small intestines entirely and expend its damage on the large bowel, as in Prof. McGraw's case. The same kind of wound high on the lateral surfaces may pass into or through the liver, without injuring the intestines, or the spleen alone if the entrance is on the left side.

If the wound is so situated that the bullet enters the abdomen through the diaphragm, adding injury of abdominal viscera to that of the contents of the chest, the surgeon's help will probably be of little use.

A wound of entrance and exit, or an entrance wound alone showing perforation of the ball from side to side through the cavity, means the worst of injuries, and suggests the need of the greatest care in staying of hemorrhage, repair of intestines and toilet of the contents.

Antero-posterior perforation, if complete, can only fail to wound the small intestines when situated well on the outskirts of the surface of the abdomen; seemingly, there can be no exception to this proposition, save in those extremely rare instances, in which the perforating body traverses the cavity without injuring the contents.

Penetration through the posterior walls of the cavity, if complete, with likelihood of laceration of important fixed organs, argues an injury of the most severe character, one in which the surgeon's art will be of no avail in the majority of instances. The exceptions, in which the severity will not prove unsurmountable, will be transit through the space between the lower end of the kidney and the crest of the ilium, and in wounds occupying the outskirts of the entire posterior surface. If the penetration be incomplete, as can, in the majority of instances, be determined by enlarging the bullet wound, the injuries are by no means necessarily fatal, and do not require any other surgical interference than the enlargement of the wound and proper dressing. Many instances are recorded of recovery from posterior penetration of the large and fixed viscera of the abdomen, without any surgical operation whatever.

What collateral evidence influences the formation of a diagnosis?

The peculiarities of the individual injured constitute so important an element in the development of collateral manifestations, that all such testimony should be subjected to the most rigorous search; in fact, much value cannot be attached to subjective manifestations. It is not necessary to state to you that one person may be prostrated and literally frightened to death by the sound of a firearm, or the "swish" of a bullet, while another will continue his course or perform his usual duties after he has been injured, and can only with difficulty be persuaded that he has been shot. Between these two extremes all gradations present themselves.

There are other phenomena, independent of personal peculiarities, which contribute to the formation of the surgeon's opinion. Among these may be mentioned: tympanitic resonance, unusual dullness on percussion, the presence of fæcal matter, or any of the normal secretions or contents of the different viscera in any of the external wounds, blood in the stools or urine, or egesta from the stomach, paralysis of any kind, persistent nausea and vomiting, and the general condition designated shock.

Allow me to briefly refer to the probable significance of these symptoms when present.

Unusual and rapidly forming tympanites would suggest the escape of the intestinal gases into the peritoneal cavity through a perforation, and, if found in a region of normal dulness, as in the liver region, it is considered good corroborative testimony in favor of intestinal rupture, by some authorities.

Circumscribed dullness on percussion, with localized bulging in the abdomen in the neighborhood of the wounds, or in the most dependent region of the cavity, argues the possible presence of blood accumulation from wound of a large vessel, and consequent penetration of the abdomen.

The rare but possible phenomenon of fæcal matter appearing in the external wounds renders the demonstration of perforation of the alimentary canal absolute. That such extrusion does occur as an early symptom after wounds made by large bullets finds illustration in the case to be reported by myself in this paper.

The presence of blood in the urine, in connection with the situation of the external opening, demonstrates a wound of the kidney, ureter or bladder; the two former adding greatly to the gravity of the prognosis, and certainly in so far as its presence influences opinion at all, such condition would favor the necessity for operative procedure.

Paralysis of any part of the body, below the level of wounds in the abdomen, necessarily complicates matters very much, rendering it very probable that the ball has not only injured the viscera in its course, but has also done irreparable damage to the spinal cord or important nerves.

"Shock" cannot be relied on as a positive indication of the presence or absence of perforation of the viscera. Cases with many perforations have presented no evidence of shock whatever. Its presence is rather an indication of some special nervous condition of the patient, of some injury to nervous structure, or, perhaps, more often than any other condition, it indicates the laceration of some large blood vessel with free bleeding, the last a condition of itself requiring abdominal section for its relief quite as surely as the rupture of the sac of tubal pregnancy, and proving quite as fatal if the operation is not done.

It is to me a source of disappointment to be compelled to put the presence of "shock" among the doubtful signs of perforation, for I was at one time fully convinced that its presence surely meant bowel wound, and I am still of the belief that when present, the probability of such injury is very great.

Absence of pulsation in either of the femoral arteries will call attention to injury of the iliac vessels, and as well, when present, gives a second point with which to estimate the course of the bullet.

In three cases of penetrating wounds seen by me, all had persistent nausea and vomiting present. Other reported cases have shown similar symptoms. It is also a common symptom with ruptured intestine from other causes: hence I deem it proper to claim that its import as a symptom be borne in mind.

What symptoms make it probable that the issue in any case will be fatal, whether operated upon or not?

It seems quite proper to say that the majority of cases of through and through perforations of the abdominal cavity, with injury to both fixed and movable viscera and blood vessels, will prove fatal in spite of the best efforts to save them. Still, it would not take much time or thought to bring to mind instances of individual experience, or cases of record, in which the injuries done to obdominal viscera, and the shock incidental to a prolonged operation performed in recognized procedures for the relief of abdominal tumor, has been quite as severe as could be produced by a bullet in transit through the cavity, and yet the patient has survived. So it becomes a difficult matter to decide when to decline operative interference. Cases of recovery have followed surgical care of the wounds when many perforations of the intestines* were found, and in which solid viscera† have been traversed by the bullet; many cases have perished in which, after death, examination showed the simplest injury to repair, and indicated the probability of speedy recovery had the abdomen been opened at once and the wounds treated. One is almost tempted to say that all cases are entitled to the chance of life offered through operative procedure. It is hazardous to predict a fatal issue. However, if the abdominal wound is complicated with a severe injury of the spinal cord, or bad wound of the solid viscera, or so great a time has elapsed as to allow of extensive extravasation and infiltration, with consequent virulent inflammation, the probability is that the issue will be fatal.

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*Hamilton, Bull.

†Murphy.

In application I will present the following cases:

Mr. J. F., shot himself in two places in rapid succession with a 32-calibre revolver. I saw him four hours after the injury was produced, and found two bullet wounds, four inches to the left of the median line on the same line with each other and one and one-half inches apart; the lower wound was even with the umbilicus. One bullet had gone through the body; its exit posteriorly was just below the last rib and close to the outer edge of the rectus muscle. There had been and still was considerable hemorrhage going on from the posterior wound. He had eaten a hearty dinner just previous to the shooting. The patient was moderately collapsed, pulse very fast and countenance pale. By the time he was anæsthetized and necessary preparations were made, darkness had come on, and the operation was done with the light from a single gas jet.

The two bullet wounds were joined by an incision and the fact of penetration demonstrated. An opening was then made in the median line four inches long through the abdominal walls. Considerable blood was found in the peritoneal cavity. This was removed and the wounded intestines sought for. These were easily found and the perforations quickly closed with a straight needle. carrying No. 1 silk thread. Five perforations were found and secured. On examining the posterior peritoneal surface a bullet perforation was found in it directly over the body of the left kidney. On passing the finger through it the kidney was found to be perforated by the bullet. The hemorrhage from the wound was at this time very slight. During this period operative procedures had to be discontinued several times to prevent the patient from choking during his attempts to evacuate the stomach, as he was vomiting large masses of meat and other food. The kidney was not removed. The wounds were closed, dressed antiseptically and the patient put to bed. He rallied fairly well in a few hours and seemed to progress nicely for twenty-four hours, when he began rather suddenly to fail rapidly and died in collapse. There had been considerable bleeding from the posterior wound, and the patient died from hemorrhage from the wound in the kidney. It is to be regretted that the organ was not removed. The other wounds were comparatively simple in character and easily secured. There was but slight extravasation and the cavity was left quite clean.

P. J.. aged 45 years; was shot while walking in the street on the night of July 4th. He was seen by me at the Presbyterian Hospital sixteen hours after the injury was inflected. I found a large-sized bullet wound in the right iliac region, slightly below and two inches inside of the right anterior superior spine. The surface had been rendered aseptic and the patient anesthetized before I examined him. The edges of the wound were more ragged and more deeply discolored on the outer and upper portion, showing that the missle struck obliquely to the surface of the abdomen and that its direction was from the right and above. Considerable fæcal matter was found in the wound. The man held his right thigh semi-flexed even when fairly anæsthetized. The right half of the abdomen, the upper portion of the thigh and buttock was fiery red in color, the margin of the erythematous blush being well marked. The respiration was entirely thoracic, the abdominal walls hard and motionless. An incision was at once made in the mid-line after emptying the bladder of a pint of urine. As soon as the peritoneum was opened large quantites of a stinking ichorous serum poured out, bringing with it fæcal matter and small pieces of potato undigested. This material was washed away by a free flow of mild boric acid solution. The wounded intestine was then sought, and after drawing out about six inches of badly inflamed tube, it was reached. It was a large perforation of the small intestine, but was secured by the continuous suture, without difficulty. All the folds of the bowel in the iliac fossa and pelvis were examined, but no other openings were found. A question of perforation of the bladder was raised, but a thorough examination with finger failed to find any. To further prove the uninjured condition of the bladder, it was distended with warm milk, but no leakage was noticed and the milk was allowed to flow away through the catheter. The external bullet wound was enlarged and its track followed by the finger. The missle barely entered the abdominal cavity at the fold between the abdominal walls and iliac fossa, and just outside of the femoral vessels, and was then lost in soft parts of the thigh on posterior surfaces. It evidently gouged out the convexity of the knuckle of intestine lying in its course.

After thorough cleansing, the wounds were all closed and drainage left in the abdominal cavity. It was now noticed that the patient had abdominal respiration and straightened his right leg. The operation was done in the presence of Profs. Gunn, Etheridge and Merriman, and Drs. Talbott, Mellish, Ward and others All expressed their belief that no other incision than that through the mid line would have enabled the surgeon to as easily and positively repair the injury and clease the cavity. The man died sixteen hours after the operation. With such extensive extravasation and virulent peritonitis as was found, no other result could be anticipated. With an early operation I believe the recovery would have been prompt in a case with so simple a wound and the absence of any complication. The case certainly points to the necessity of prompt relief in these injuries. The post mortem confirmed all the facts ascertained during the operation, and I have present a section of the bowel showing the wound and the condition of the suture used to close it.

One can fairly believe that the abdominal incision adds but little to the patient's danger, and if there be any, it is quite offset by the benefits accruing from a perfect knowledge of the wounded person's true condition, as is exemplified in the following case:

Dr. John I. Skelly, of Potomac, Ill., reports, in the July number of the *Annals of Surgery*, a case of penetrating shot wound of the abdomen. The cavity was opened by median section; no injury to the intestines was found, the bleeding was controlled, the peritoneal wounds sutured, and the patient recovered. The injury was done by a bullet from a 32-calibre revolver. Great shock was present in this case although no important viscera were wounded. Dr. Skelly refers especially to the great confidence in recovery, expressed by the patient, when assured that the intestines were not injured.

What technical measures are best in the treatment of bullet wounds of the intestines, mesentery, stomach, kidney, spleen, liver and bladder?

It is yet my firm conviction that in the great majority of cases the incision in the mid line will allow the most room for all the manipulations absolutely necessary on the surgeon's part, and yet be conducive of rapidity of action. It will furnish the surest way of following the course of the bullet, and thereby enhance the certainty of securing all injured viscera in all cases of through and through perforation, especially if the course of the ball is transverse, oblique or median. It will furnish the best way ot reaching all parts of the cavity through which to insure perfect toilet of the peritoneum. Prof. McGraw's case shows there may be exceptions to what it seems should be the general rule. Here, as elsewhere, each case has its own indications and must be managed according to them.

It seems proper for me to refer to a few conditions found in the wound of the intestine itself dependent upon the character of the ball producing it, previous to passing in review the means to be adopted for its closure.

The character of the wound in the bowel depends greatly upon the size and shape of the bullet producing it, and much also upon the velocity of the missile. Round bullets moving rapidly make a clean cut, rather small wound with the minimum amount of bruising, so that they are comparatively easy to close. Rapidly moving conical bullets do much more damage than the round; still, even with these the great velocity makes the injury less severe than might be expected from such terribly destructive agents. The extent of bruising is greater, the edges of the perforation are more ragged, still, if they strike the tube fairly in the lateral surface many such wounds can be safely managed without resection. The greatest amount of damage, in my experience, is done by the rather slowly moving missile, be it either round or conical; these tear, mash and lacerate the tissues instead of making a clean punch, like the swift ones.

However made, the large proportion of perforations in the bowel will be well secured, and quite rapidly, by means of the continuous stitch, applied so as to invert the edges of the wound towards the lumen of the tube, by entering the needle a safe distance away from the margin of the wound and sewing over and over until all of it is covered with the opposite surfaces of the peritoneum held together by the stitches.

As the result of experimental research, the following statement was made by myself in 1885 in an address before the American Medical Association, written on this subject. "This way (that is the use of the continuous suture) of treating the bullet openings in the bowel is susceptible of much wider application than would appear possible at first glance. I am quite well satisfied that it will take the place of excision in not a few cases of quite severe injury. The torn edges of the wound can be turned in, and peritoneal surfaces fastened together, even in large wounds, with perfect confidence in the result of safe and secure adhesion following."

This statement has been borne out absolutely in my own experience since then in the human being, and I believe it is the experience of all other operators. In no instance in any of the reported cases submitted to surgical treatment, since then, do I remember that the operator has been called upon to make a section of the bowel. All seem to have trusted to the continuous suture over the inverted wound, The recoveries are a positive evidence of its success and none of the fatal cases show a failure to secure the bowel wound by its use. It apparently makes no difference whether the wound in the bowel is closed parallel to to the course of the tube, or transversely or obliquely. The result is the same, provided the stitches are securely taken. Of course, the most easy and most rapid method of procedure is the best to be adopted, and of this the operator must be the judge.

With a through and through penetration of the cavity, we may expect to find clean perforations and the openings of minimum size in the intestine; with a single entrance wound, arguing diminished velocity of the bullet, the tube openings will be very likely ragged, bruised and difficult to repair without sacrifice of intestine.

If the perforations found in the bowel are situated fairly away from the mesenteric surface, little difficulty will be found in carrying out the manipulations necessary for their closure. Still, in cases in which many perforations of the tube are close together the intervening portions between the wounds have their vitality so greatly impaired by contusion, that complete resection of the implicated portion of intestine will be required.

When the ball opening is directly at the mesenteric junction repeated instances of imperfect union followed by extravasation have occurred to me in experimentation. This kind of injury requires exceptional care in the application of the sutures, so that they include something more than the pertioneal covering, and do not include the larger blood vessels entering the coats in this position.

When the injury is so extensive as to positively require resection of the wounded portion, my experience from experimental injury, was positively in favor of two methods of procedure. 1st, cases in which the mesenteric border could not be saved, were most successfully treated, by making the section in healthy bowel tissue, and removing the injured portion with a triangular piece of the mesentery, the base of the triangle representing the length of intestines, removed. The first sutures are best introduced at the mesenteric border of the divided ends of the intestines, because this plan furnishes more room, in which to make sure of the engagement of sufficient tissue in the loop of the suture, to make a fast and secure hold, than there would be if the other portions of the circumference were united before reaching this border. Failure to get good union, and to avoid extravasation, followed in every case in which this plan was not adopted.

Neither in man nor animal, have I found it necessary to introduce more than one row of sutures, either in the repair of single perforations, or in complete resections, provided the hold of the suture included about one-third of an inch of peritoneum with underlying muscular coat, and the sutures were placed about one-eighth of an inch apart.

In no instance, in my experience, except when drawn too tightly, have the sutures failed to perfectly close the opening so that at the end of twelve hours sufficient plastic adhesion had taken place to resist powerful hydrostatic pressure, and, that too, in cases in which there were thirteen perforations in eighteen inches of intestine.

That method which safely accomplishes the object of surgical interference, in the quickest possible time, and with the least possible disturbance of the viscera locally, or in general, is the best to adopt; saving of time alone is of vital importance to the patient.

The edges of the divided mesentery should be sutured and all raw surfaces covered with peritoneum by means of stitches, with very fine catgut or silk, in order to avoid leaving any secreting surfaces free in the peritoneal cavity.

Second. Cases in which the mesenteric or nutritive border can be saved. A plan which I have successfully adopted experimentally is as follows: The wounded part is cleanly cut out leaving the uninjured mesenteric portion. From this the mucous membrane is stripped, and the muscular coat with its peritoneal covering, drawn downwards in a loop. This loop is closed with stitches and the bowel circumference remaining, fastened as in complete resection. This method produces no flexure of the bowel and does not interfere with the free flow of blood in the vessels coming from the mesentery.

The most reliable and safest clamps, for use in holding the bowel during the manipulations of making a resection, were found in experimentation to be the fingers of an assistant, and further experience has not changed the result of that observation; they can do the least damage, and produce the least amount of shock, and will prove an intelligent aid to the operator.

The wounds of the large intestine can be rapidly, and usually easily repaired by means of the continuous stitch on account of their large calibre and comparatively thick walls. Here, if anywhere, the wounded bowel can be reached through an enlargement of the external bullet opening, as has been successfully done in one case by Professor McGraw, of Detroit, but this is only possible, in my opinion, in cases in which the shot is a direct antero-posterior one, over the course of the large intestines, and does not touch any small intestine. It seems impossible to me so easily to find the injured parts, or so rapidly repair them; or to carry out so successfully proper cleansing of the cavity, through any other incision than the median section, in oblique or through and through penetration in any transverse plane of the abdominal cavity. My belief is based upon trials on the cadaver, and living animals, and wounded men. No other incision, to my mind, gives such perfect command of the entire cavity.

In one instance an incision extending over the entire length of the lateral surface of the abdomen and fully to the midline of Poupart's ligament, failed to enable the operator to find the vessel from which the fatal hemorrhage came. The track of the bullet could be traced to the opposite side of the cavity, but the intestine could not be drawn through this lateral incision so as to properly explore the course of the ball, There was no wound of exit. It seems very probable that the median section, by bisecting the bullet's course, and allowing easier access to the cavity would have made this case, as it will others, simpler to manage, at least.

It is a matter of record in surgical experience that the wounds confined to the large intestines have often been recovered from without surgical interference, still, it is certainly probable that the number of recoveries will be increased, and rapidity of restoration to health more surely provided for, by closing the wound in the intestine and cleansing the cavity at once, and without adding materially to the patient's danger.

In animals, and probably likewise in man, a perforation of the great omentum is followed, sometimes, by a universal extravasation of blood throughout the meshes of the mass, producing a condition that requires ablation of the greater portion, after proper ligation. The end of the stump left after separation can be covered by sewing adjoining surfaces of peritoneum over it. All slits or openings in the mesentery should be carefully closed with the continuous suture so as to avoid contaminating secretion into the peritoneal cavity.

The wound in perforations of the stomach is occasionally difficult to find, but when found, no difficulty is met with in applying the means of closure. The continuous suture has not failed to securely fasten them, and in every instance they have been followed by speedy recovery unless they were complicated by severe injuries to other viscera.

There are on record quite a number of cases of penetration or perforation of the liver alone followed by recovery. If in doubt, with a posterior wound of entrance, enlargement thereof, with antiseptic care and dressing, would be justifiable. With an anterior wound, the course pursued by Dr. Murphy, of Chicago, in a case reported by him, was followed by recovery. Median section was made, the cavity cleaned of blood, and the wounds on the surface of the liver drawn together with catgut sutures. In my experience, wounds of the liver were managed in the same way and did well if the sutures were deeply placed.

Wounds of the spleen bleed freely and are difficult to manage with sutures on account of the brittle nature of the spleen tissue, still sutures rather deeply placed will hold the edges of the perforation in apposition. If badly lacrated, the many reported cases of recovery, after complete removal of the spleen for injury, rather indicate that extirpation is the best means of treatment in such injuries.

Perforation and wounds of the kidney, from the character of the organ and the profuse hemorrhage from its torn surface, from the danger of urinary infiltration and decomposition, seem impossible to manage without extirpation, especially if injured by an anterior wound of entrance. In one case of my own a complete perforation of the kidney was found. It was decided to leave the kidney. The patient did well for about twenty-four hours and then succumbed to a profuse hemorrhage from the wounded organ. It seems the chances would have been better with it out.

If the kidney is wounded, with posterior opening only, and enlargement thereof shows the injury to be confined to this organ alone, the cavity of the abdomen is not perforated, and recovery is possible either with or without removal of the organ. Perforation or damage done to either the liver, spleen or kidneys, accompanying similar injuries to the small intestines, greatly increases the gravity of the case. and probably very few cases will recover, whatever is done for their relief.

Sir William MacCormac has positively demonstrated the success, following abdominal section in ruptures of the bladder, in order to securely suture the wound. It is proper to infer that bullet perforation of the viscus can be quite as easily secured in the same way.

The results of the experience of Varick, of New Jersey, and Wylie, of New York. should always be borne in mind. They have demonstrated that hot water introduced into the peritoneal cavity accomplishes three purposes of great moment: relief of shock, arrest or abatement of hemorrhage, and cleansing of the cavity.

I think carbolized silk of fine size is the best material to use for the bowel suture, simply because perfectly reliable catgut cannot always be obtained, and the risk is too great, if there be the least likelihood of any strand giving way. No doubt, well prepared catgut may answer every purpose, but the silk never fails to do the work required of it satisfactorily.

If asked what are the points most likely to be neglected or slighted in such an undertaking as giving surgical relief to a case of perforating gunshot wound of the abdominal viscera, my attention would be drawn to the items leading to failure in experimentation, and the conditions mentioned as found in the repeated unsuccessful cases in man. Among these would come first the paramount necessity of searching out and securing all bleeding vessels, dependent upon the danger of immediate or secondary hemorrhage. Hamilton, of Washington, tells us that his successful case passed through a period of extreme danger, in the last days of his illness, from the formation of a blood tumor. Murphy, of Chicago, reports a case lost from post-peritoneal bleeding. And in this case post mortem showed all the intestinal wounds thoroughly closed and water-tight. I have reported a case in which the immediate cause of death was kidney hemorrhage.

It is, no doubt, a hazardous ordeal to put a patient through, to examine the intestines from one end to the other in order to be well satisfied that no perforation has been overlooked, yet it is far more hazardous (in fact the result will be surely fatal) to leave an opening in the small intestines untreated. In some of the reported cases wide open bullet wounds have been found with their surrounding fæcal extravasations and contaminated blood.

It is to me extremely doubtful if all the wounded parts will be found, in an estimated transverse plane drawn through the demonstrated track of the bullet, especially if the missile implicates the ever gliding and moving small intestines. I am not prepared to believe that a supposed probability as to the seat of injured parts, should take the place of a regular, carefully made and satisfactory search for the wounds, and yet I would very carefully avoid practicing, or advising any procedure that might unnecessarily add to the shock already present. We do not know all that it is best to do yet, and still we do know that failure to close all the wounds means death to the patient, and some risk must be taken to avoid so great a hazard.

It needs no argument or demonstration to prove the harm resulting from tight suturing. It has been my experience to see in animals the edges of several wounds slough away to the extent of the bowel tissue included in the sutures, followed by extravasation, making a failure out of a case that otherwise gave good promise of being a success. The temptation is great to be over-sure of good union. In my experience peritoneal surfaces need only be laid in contact with each other and kept quiet for a few hours in order that adhesion may occur. The paralyzed condition of the bowel at the seat of wound from the injury, in itself favors this desirable quiet.

CHAPTER III.

RENAL CALCULUS AND SURGICAL OPERATIONS UPON THE KIDNEY.

The next patient. a working woman, twenty six years of age, has this history: Three years ago she was taken with severe pain, suddenly coming on, referred to the left side of the abdomen in the neighborhood of the left kidney. The pain extended over the front of the abdomen, after a time, and spasms of it, described as shooting, ran down towards the left side of the pubis. After lasting for a few hours it ceased quite as suddenly as it began.

During the presence of the pain the patient felt a frequent desire to pass urine, but discharged only a tablespoonful or so at every attempt to evacuate the bladder, and its passage was accompanied with considerable tenesmus and a severe burning pain. When the attack ended the urination was accomplished easily and attended with a large flow of urine.

In addition to the agonizing pain which marked the onset of this attack, and which persisted during its continuance, the patient suffered from nausea and vomiting. There was also great pallor of countenance; the features were pinched; the skin was bathed in clammy perspiration; and all these were associated with symptoms of profound constitutional disturbance of the circulation and nervous system.

This aggregation of symptoms accompanies the passage of a renal calculus, or kidney stone, from the pelvis of the kidney into the ureter or through it into the bladder.

The pain commences as soon as the stone enters the ureter, and does not cease until it either falls back into the pelvis of the kidney or is forced by the accumulation of urine behind, aided by the contractions of the muscular fibers of the ureter, through the length of this tube into the bladder. Knowing this you can readily understand the special character of the accompanying pain in that it commences suddenly and ends as quickly. This cycle of events is termed technically an attack of renal colic.

Remembering that there is a fair sized cavity at the renal end of the ureter, consisting of the pelvis of the kidney, and a very large cavity at the opposite end, in the shape of the bladder, you are prepared to understand how a stone or a shred of tubercular tissue, or a dense clot of blood, may, on the other hand, just enter the ureter and be displaced therefrom by some sudden movement of the patient. The renal colic caused by its impingment in the ureter suddenly ceases when it falls back into the pelvis.

As well can you understand how the attack of colic is far more severe and more prolonged if either of the foreign bodies mentioned is compelled to make the long transit through the entire ureter into the bladder, when the pain will also cease suddenly.

Such attacks of colic will occur at intervals so long as calculi form in the calices of the kidney and are displaced therefrom, and take up their journey to the bladder, as is the condition in quite a number of individuals.

Similar attacks may occur if there are present in any patient certain other pathological conditions of the kidney, such as tuberculosis, or cancer, or papilloma, etc. It is true also that calculus formations are very apt to be associated with these pathological conditions.

We find in this patient, that she was free from any return of the attack until eighteen months after the first manifestation described, since then she has suffered from them as often as once in every two or three months. Since the second attack, the urine has contained concretions of urinary salts, some of them of considerable size, as large as a kernel of wheat, or larger. The urine has shown the presence of pus and blood in some quantity; of late the pus has been present in large quantities.

The patient's general health has suffered very much, until now she is emaciated, weak and broken down in spirits and physical strength, and is practically a confirmed invalid.

Some time ago her attending physician, while making an examination of the painful region during an attack of colic, discovered a tumor occupying the situation of the left kidney, and now you can see this tumor, showing as a slight projection of the abdominal walls on the left side over the neighborhood of the kidney. It is quite easy to feel it with the fingers of one hand pressed against the tissues between the last rib and the crest of the ilium, while the other hand is pressed against the front of the abdominal walls.

It is slightly movable, semi-elastic, smooth and even of surface, and is the left kidney distended with fluid of some kind. Probably the fluid is pus, as such a large quantity of this material is found in the urine, and its presence is due to infection with the pus microbe through the genito-urinary tract.

It is my belief also, that there is present one or more calculi, and this is based upon the fact that so many calculous concretions have been passed in the urine, as well as upon the fact that renal calculi are very sure, sooner or later, to be accompanied by an accumulation of pus through infection.

It is scarcely possible that this will prove to be a kidney affected with tuberculosis either with or without a stone, because it is unusual to have no other manifestations of the tubercular infection than is present in this one kidney, besides the bacillus of tuberculosis has not been found in the urine.

The diagnosis in this case is renal calculus with suppurating kidney.

It is, as well, certain to me that the substance and capsule ot the kidney is intact, because had destruction of these taken place by ulceration or tissue necrosis, a peri-nephritic abscess would have formed, with the usual signs of accumulation in and bulging of this space between the rib and ilium.

A few days ago, we had occasion to direct you that whenever a patient came under your charge suffering from indications of bladder disease, never to think your examination is complete until a sound has carefully searched every portion of the bladder cavity. In this case we have an additional caution to give; never to be satisfied with an examination of a case of disease of the genito-urinary apparatus, without a rigorous inquiry into the condition of the kidneys by resorting to inspection and palpation of the organs themselves, as well as their entire neighborhood, just as carefully as you would examine their secretions microscopically, and by all known tests, for evidence of change from normal condition.

In all these operations the primary incision to expose the kidney is made in exactly the same way, and all the steps will be illustrated to you upon this patient; and as we will no doubt find a calculus and remove it—this will be a nephrolithotomy.

The direction is given, in order to make the diagnosis in such cases absolute, to sound the kidney by means of an exploring needle carried into the substance of the kidney, with the hope of having it come in contact with the stone—to strike the stone as it is termed—a very positive confirmation, if it can be elicited.

It is even advised to go so far as to introduce the needle into the organ in several different directions for this purpose; and the trial has often been made before the primary incision uncovers the kidney, but of course oftener with failure than with success attending its practice.

Even after the kidney is to be seen at the bottom of the external wound, the exploring needle, or the probe, or even the finger introduced into the pelvis of the kidney or through its substance, sometimes fails to find the calculus; especially when it is small and hidden in an expanded calyx. Consequently you are not to conclude hastily that there is no stone present if this test fails even when the kidney itself is under inspection; certainly not, if the trial does not determine its presence when the instrument is introduced without an incision.

Given pointed and unmistakable evidence of the foreign body, as indicated by the occurrence of repeated attacks of renal colic —with deep-seated and continuous pain referred to one kidney—with pus or blood or both, in the urine, even in comparatively small quantities, yet constantly discoverable; with the history of the passage of concretions of urinary salts; certainly if several, or all, of these signs are present in a marked degree, the surgeon is justified in exposing the kidney and incising its walls freely, in order that the pelvis can be explored in all directions and portions, by the finger—truly the only reliable probe.

It is true that even this crucial procedure sometimes fails to bring forth the calculus or to discover its presence. The kidney has been exposed a number of times and the pelvis explored without finding a stone. The renowned Mr. Henry Morris, of England, relates a case in which failure followed his search, but so well convinced was he of the presence of the foreign body, on account of the marked symptoms of his patient, that he proceeded to do a nephrectomy and found the stone in one of the calices of the kidney after the organ had been removed from the body. Mr. Morris was among the first, to diagnose the presence of a stone in the human kidney and to deliberately plan, and successfully execute, an operation for its removal.

It has happened to me to fail to find a calculus on two occasions. In one a large calculus had been removed from the other kidney a year previously; in the other it seemed certain that the stone was lodged low down in the ureter. We may be able to get at it yet.

If an operation is done merely to expose the kidney and incise it, the operation is termed a nephrotomy. If, in addition, the operation is done to remove a calculus from the kidney, it is termed nephro-lithotomy. If the operation is to relieve the distressing symptoms due to the extreme mobility of the organ, called a movable kidney, in which the organ is first exposed and then fastened in some way to the edges of the wound, it is termed a nephrorrhaphy. If the operation is done to remove the entire kidney through the tissues of the back, it is termed lumbar nephrectomy.

Prognosis.—The successful ending of the many operations already done and being done upon the kidney for a variety of diseases, is leading surgeons to the conclusion that the operations are not especially hazardous. My own experience, embracing all the operations performed upon this organ, and including several repetitions of some of them, points in the same direction. There has been but one death, and that followed the most formidable of them—a nephrectomy for a greatly enlarged suppurating kidney. All of the operations short of nephrectomy have ended favorably and with rapid recovery. The simpler procedures of exposing and exploring the organ are not attended with much danger, if such rigorous aseptic precautions are taken as are secognized by every surgeon as necessary in all operations.

You understand that the incisions which we will make in this case, are exactly the same in every respect as those which are necessary for the execution of a nephrotomy, a nephrorrhaphy or a nephrectomy. The external incision should be about four inches in length, and made parallel with the last rib and fully half an inch below its lower border; commencing posteriorly, a little behind the prominent ridge marking the external border of the erector-spinæ muscle. The course of the incision should always be made as directed, at the distance mentioned below the border of the last rib, on account of the dangers of opening the pleural cavity in any case in which the pleura descends below that rib or in cases in which there is present a supernumerary rib, or in which one rib is absent, and the normal relations of the pleura thereby altered.

The patient should be placed in the position here illustrated, on the sound side, with a tightly rolled pillow, covered with an oil-cloth having an aseptic towel over it, placed under the opposite loin; thus the side to be operated upon will be made very prominent, and the interval between the rib and the crest of the ilium increased to its fullest extent.

The first incision should be carried with a free hand through all the tissues and fasciæd own to the anterior layer of the lumbar facia. The length of the incision through the deep tissues being the same as that through the skin. The operator should avoid opening the sheath of the erector-spinæ muscle. All bleeding vessels are secured.

The anterior layer of the lumbar facia is then opened and divided to the extent of the wound. As soon as this is done, there wlil bulge into this opening, the peri-nephritic tissue in which the kidney rests. Its investing connective tissue should be opened and the operator will then readily recognize the peculiar white fat surrounding this organ. A portion of this fat may be pulled out and snipped away, or its spaces opened and torn by the fingers, as you now see me do, after which the kidney can be readily felt by the finger or seen with the eye, as a darkish red body, moving slowly up and down with each respiratory act.

If the kidney is not now easily found, as is frequently the case if it is not enlarged to any extent, it can be brought into view sometimes by a simple procedure. An assistant introduces two fingers into the wound and pulls strongly upward against the last rib. This widens the wound and at the same time stretches the peri-nephritic tissues towards the wound. The assistant with his disengaged hand should also press strongly backwards through the anterior abdominal walls over the region of the kidney, thus pushing it into the wound.

The space for operative manipulations, in cases of enlarged kidney, can be greatly increased, and with safety, by a vertical incision commencing in the one already made, and carried downwards towards, and forward parallel with, and close to the crest of the ilium. With the finger deep in the wound as a guide, this latter incision can be rapidly made without danger of opening the peritoneum. It was used upon one occasion successfully by myself in the removal of a kidney enlarged to the size of a cocoanut; and made a space large enough for all the necessary manipulations without difficulty.

After the kidney is exposed in the manner described and brought fairly under the touch of the finger and the sight of the eye, by the removal of its investing fat, the next step will depend upon the operation which is being performed.

In this case the object is to remove a stone from the kidney and evacuate what other accumulations may be present. So we will now first introduce the finger into the wound and palpate the kidney over its anterior and posterior surfaces, reaching as far beyond the pelvis as possible in both directions.

The best command of the kidney can be obtained in these cases. by the finger passed over its posterior surface. The finger used in this way will sometimes detect the stone in the kidney, or determine a noticable bulging and hardness is some portion of its surface which may indicate its presence.

If no information is gained by this examination, the kidney is fixed as much as possible in the wound by pressure through the anterior walls of the abdomen, and by forceps grasping the perinephritic tissue; then a grooved director is thrust through its substance towards and into the pelvis, which is examined thoroughly in all directions by changing the direction of the probe, until the stone is struck, or none is found. Of course, if, as in this patient, the tissue of the kidney and its pelvis is distended with pus, as soon as the director enters the cavity the pus will flow through its groove, as you see it does in this instance.

The blunt-pointed director is the best instrument to use in this trial; it or any other cutting instrument, should always be introduced into the kidney some little distance above the lower end of the organ, on account of the frequency of the presence of the artery aberrans entering the organ at this point, and the free hemorrhage attending the wounding of it. It is also said that fatal hemorrhage has followed the use of the pointed aspirator used for this purpose, the needle being thrust so far forward as to puncture the main renal artery or vein.

No attempt should be made to fix the kidney by means of forceps attached to its substance, or by threads passed through it, because, owing to the structure of the kidney tissue—its softness and brittleness—they will surely tear out: no fixation will be obtained, merely unnecessary damage done the organ. It can sometimes be fixed very well by passing the finger behind it in the wound.

In case no pus escapes along the groove of the director, as not infrequently happens when the kidney is not much increased in size, and it is thought necessary to make further exploration, a scalpel is carried along the groove of the director through the substance of the kidney, making an incision large enough to admit the finger easily; the finger is passed through it into the pelvis of the kidney and a careful search made in all directions for the foreign body.

If the stone is of large size, filling and distending the cavity of the pelvis, the examination by palpation of its entire surface, as already described, will have probably discovered its presence; in which event the knife is carried directly through the substance of the kidney to the stone, and the proper incision made. If the stone is discovered by the use of the director, without any flow of pus, an opening is made by the knife sufficiently large to admit the finger.

In this patient, in which pus is found to be present, after the introduction of the director, the incision should be made as free as possible, not only for the removal of the stone, but especially to lay open freely the pouches which are so apt to be present in these cases. This will provide for free drainage and prevent the retention of pus in these pockets, as the kidney contracts after operation, leading to the occurrence of secondary abscesses so common in the history of suppurating kidneys.

How will you proceed after the finger has touched the stone, no matter by what method it has reached it? The calculus is carefully and slowly loosened from its bed, by keeping the pulp of the finger in contact with it, and pushing the investing tissue away from it by the finger nail carried in all directions, until the stone lies perfectly loose in the cavity. Then a pair of dressing forceps introduced along the finger, is made to seize the stone firmly, and it is drawn quietly and slowly through the wound until its removal is accomplished.

The directions about removing the stone are thus minutely given, because it is especially desirable to remove it entire, and thus avoid leaving any small pieces, which, owing to its brittleness, can be easily broken off. They often avoid the most rigorous search and become the nucleus, around which may form other stones in the future.

Besides, the calculi are frequently very irregular in shape, having off-shoots developing from the main stem, in different directions, like pieces of coral. These off-shoots are firmly embedded in the calices of the organ or accidental pouches, so that they are easily broken off, and may remain embedded in these pockets if any forcible attempts are made to withdraw the stone before it is entirely loosened by means of the finger.

Of course many times the stone or stones, are found loose in the pelvis of the kidney, or in the cavity of the abscess, or they are smooth of surface and even and regular in their development, in which case there is no difficulty attending their removal.

In this patient, you notice that I have considerable difficulty in loosening the stone which we have found, and I am compelled to enlarge the opening in the kidney very much, because the stone is of large size and very rough and irregular in its shape. Now I think I have it loosened and the incision made long enough to allow of its easy exit. Introducing this pair of forceps, the stone is seized, and while extracting it slowly and carefully, with my finger I push the kidney substance away from its irregular surfaces. Unfortunately I have broken this piece in the grasp of the forceps, away from the main portion of the stone, which accident, not only spoils the beauty of the specimen, but shows you how brittle the concretion may be and how carefully it must be handled. There is no fear of this fragment causing any subsequent trouble because I have it on the outside. The stone is seized again with the forceps, at a larger, denser portion of its surface, and with the same careful method of extraction, it is finally removed entire.

The specimen is fully three inches long and over an inch in width at its widest portion. It is very irregular in formation and shows the presence of the offshoots, to which your attention has already been directed.

The hemorrhage is very free following the first incision made into the kidney substance, but in my experience, it has never been hazardous or sufficient to cause any anxiety, for the pressure of the finger, introduced through the wound, soon causes it to cease.

The manner of treating the wound is different according to whether pus be present or not. If there be no pus and the kidney not much enlarged, very little special treatment is required.

A large size drainage tube, long enough to reach into the pelvis of the kidney, should be introduced and left for a few days to provide for the easy exit of bloody serum and urine, which will flow immediately after the operation and as a consequence of it. The external wound is closed up to the drainage tube, by means of interrupted silk sutures passed through all the tissues of the edges of the wound in the same manner as in the abdominal operation, although in this operation, there is no peritoneum to be included in them.

The drainage tube prevents the probability of the occurence of urinary infiltration.

After a few days clear urine will flow through the tube, when it can be removed and the resulting sinus will rapidly close and securely heal by cicatrization, leaving nothing to mark the occurrence of such a severe operation, but the external scar. The urine passed from the bladder, will show the presence of blood in a greater or less quantity for a few days, gradually resuming its normal condition. This symptom has its advantage, because it proves that the ureter is patulous.

If pus is present, the several pockets in which it is apt to be contained are usually found to be separated from each other by incomplete trabeculæ of connective tissue or kidney substance. These are broken down with the finger, thus converting the many into one cavity; this cavity is then thoroughly irrigated and washed with some mild antiseptic solution, such as boric acid or with sterilized water.

It is to be remembered, that solutions of powerful antiseptics, especially mercuric bichloride, contain in themselves the elements of extreme danger, in that they may poison the general system or seriously impair any normal tissue which may remain in the organ itself. Hence, if used at all, great care should be practiced and the cavity thoroughly washed out with sterilized water after their use. The use of bichloride of mercury sometimes leads to acute granular degeneration of the kidney.

The ragged portions of debris are then removed, and when thoroughly and satisfactorily cleaned, the cavity is packed to the bottom with iodoform gauze. No attempt being made to close the wound by suture. This treatment is advised, because it is my belief that it is least likely to be followed by secondary abscesses. In all conditions, the external dressing consists of the application of masses of loose iodoform gauze and borated cotton, held in place by a body bandage.

The operation, as you see, is prolonged, and hence likely to be attended with evidences of shock, therefore every provision should be adopted to counteract the dangers which accompany such conditions by the administration of quinine or whiskey before the operation; by keeping the patient's body covered with blankets during the operation and by providing artificial heat through radiation after the patient is put to bed.

The profession has come to the conclusion that chloroform is the best anæsthetic to use during all operations upon the kidney, but no matter what anæsthetic is used, the anæsthetizer should be careful to give as little of it as possible; often allowing the patient to breathe freely of fresh air, by the removal of the cone, in this as well as in all operations which are prolonged and exhaustive in character.

Kidney stones are developed from the salts of urine, which are normally held in perfect solution and are oftenest found to consist of the crystals of uric acid. Many are made up of oxalate of lime, while some are composed of phosphatic salts. They are found in both sexes and at all ages of life; they vary immensely in number and size, thus they may be so small as to pass easily through the ureters when loosened, and escape from the bladder; or so large as to change very greatly the shape of the kidney which is expanded about them. In form they may be smooth and even, or rough; or possess the greatest diversity in shape and irregularity of surface.

The symptoms indicating their presence have already been described to you as forming the history of an agonizing attack of renal colic. Still there may be no signs present indicating their existence, other than a steady, persistent, deep-seated pain, sometimes burning in character, referred to the region of the kidney, accompanied by the persistent presence of blood or pus in the urine. The suffering in these cases bears no relation to the size of the calculus—one patient from whose kidney I removed a concretion not larger than the end of the little finger, suffered repeatedly with excruciatingly severe attacks of renal colic, while in another with a larger calculus than the one removed to-day, the pain during such attacks was not severe.

These formations may take place in both kidneys at the same time, and when this occurs there is great difficulty in forming a conclusion on which kidney to operate, or whether to resort to surgical interference or not.

In all these cases, the microscopical examination of the urine is very apt to show the salts of which the stone is composed, present in the urine in large quantities.

If there is present a tumor in the region of the kidney, with the history of previous attacks of renal colic, there can be no doubt as to the diagnosis, and surgical interference should be practiced.

Treatment.—The treatment of these cases must be be considered under three heads: prophylactic, palliative, and surgical. The latter has been illustrated to you in the operation performed upon the patient before you.

Prophylactic treatment consists in directing your patient's diet —avoiding the use of meats; and advising the free use of water, especially such mineral waters as are known to have a beneficial effect upon the condition of the system termed lithiasis. The mineral water possessing the best effect is probably the one containing a large per cent. of the salts of lithia. It is my belief that large quantities of distilled water are beneficial. It is generally supposed that people living in countries in which the water used for all purposes contains a large portion of lime, are most likely to suffer from these troubles. It is also supposed that in children poor and improper food accompanied with faulty assimilative powers, have much to do with the production of the disease.

The palliative treatment has reference particularly to the management of the attacks of renal colic, the pain of which is controlled by the use of the preparations of opium, particularly the hypodermic injection of morphia, in doses of such size and sufficiently often repeated as is required to control the pain.

Frequently in severe attacks the careful administration of chloroform or ether to partial or complete anæsthesia is necessary to at least temporarily assuage the patient's agony until the foreign body has passed the ureter.

Hot fomentations freely applied over the painful area and the use of hot baths are beneficial. We know of no remedy, the administration of which through the mouth, will dissolve or in any way diminish the size of these renal concretions. No permanent relief can be given in any other way than by the removal of the offending body by surgical interference.

Renal calculi occasionally become lodged in some portion of the ureter; the most common place of stoppage seems to be near the point of termination of the tube in the bladder: at least quite a number of instances are on record in which the calculus forming in women, has been located in this position by vaginal examination, and their removal attained by operation.

If the stone becomes arrested at other points and cannot be located as in women, catheterization of the ureters can locate it; or if the kidney has become exposed in search of it, the passage of a sound from above will fix its position. When found it must be, and can usually be safely removed by any operation which will expose its position. Of course any operation for this condition should be post-peritoneal.

The urinary fistula following such procedure is not usually permanent, but heals kindly and rapidly; every precaution for free drainage should be used to prevent urinary infiltration into the loose tissues in which the necessary incision is made.

Suppuration in the kidney and accumulation of pus dependent upon any other causes, such as tuberculosis or other degenerative changes, sometimes lead to the formation of various enlargements or tumors of the kidney which fluctuate freely.

The condition of distention of the kidney substance and its pelvis with pus, is technically called "pyo-nephrosis," and for its relief requires exposure of the kidney in the manner just illustrated. The abcess is then opened by free incision through the kidney. This operation is called nephrotomy. The treatment after the incision is the same as for cases of stone with pus accumulation. A similar distention, frequently reaching great size, follows injuries or diseases which occlude the ureter and there occurs the formation of a fluctuating tumor, the contents of which are clear, pale in color, and contain a slight evidence of the presence of urinary salts. This condition is called "hydro-nephrosis."

While the pus cases always show severe constitutional disturbance, with sweatings, chills, high fever, and other evidences of septic infection, hydro-nephrosis causes very little or no trouble until the increase in size calls attention to the tumor, and produces a varying amount of discomfort.

Aspiration, with a complete emptying of the cyst (for the kidney substance is so attenuated and thinned out it forms nothing but a cyst wall) will sometimes cure a hydro-nephrosis, at other times a cure will only follow free incision and drainage of the tumor by means of a nephrotomy.

In cases of pyo-nephrosis, as the result of pressure necrosis or ulceration from accumulation, the capsule of the kidney is destroyed and the pus leaks out into the surrounding cellular tissue, forming a peri-nephritic abcess, with the local signs of bulging of the space between the rib and crest of the ilium; with hardening and infiltration of all the tissues of the back in this space; with redness of the surface and œdema and finally circumscribed fluctuation. The abcess points and breaks of its own accord or the surgeon incises it. Sometimes the opening in the kidney can be found, at other times not. If a fistula persists after the opening of the abcess, always suspect the presence of a calculus in the kidney. Expose and remove it by the proper surgical operation.

Hydro-nephrosis is classified under the head of cystic tumors There occasionally form in connection with the kidney, simple serous cysts, and also those dependent upon the presence of the echinococcus or hydatid. Both of these conditions are successfully treated by exposing the tumor, incision and drainage, or sometimes by simple aspiration.

It is quite surprising how seldom urinary fistulæ persist even after very extensive incisions and bruising of the kidney. The urine may flow through the wound in the back for a few days or weeks, but if the ureter is patulous, they are quite certain to close. Wounds of this organ heal quite as rapidly and as permanently as those of any other tissue of the body.

The operation of nephrectomy, or complete removal of the organ, is a very serious one primarily, and has dangerous sequelæ attending it, even if the patient recovers from the operation, for the remaining kidney, called upon to do double duty, is particularly liable to the occurrence of diseases apt to be fatal.

It should always be remembered that the abnormality of one kidney is not very infrequent, or that the two may be joined together in the peculiar formation of a horse-shoe kidney, sometimes found present. A nephrectomy under these conditions would necessarily prove fatal. The operation should not be advised or undertaken except under the most pressing need, that is, in cases in which the disease or injury is of more menace to the life of the patient, than this hazardous operation.

It should also be remembered that even in advanced disease of the organ, in many cases, there still remains a considerable portion of the kidney substance, able to perform a portion of the normal function of the organ; a patient with a badly damaged kidney, is in less danger, if some portion remains to do duty, than after the entire removal of the organ. Every means possible should be resorted to, to determine the existence of the abnormality of one kidney before the operation is done. Some surgeons recommend the catheterization of the ureters, in order to establish this fact; others favor what is termed abdominal incision—anterior operation—so that after opening the abdomen both kidneys can be found, before either is removed.

The first successful nephrectomy was done by Simon, of Germany, for an incurable fistula following a difficult parturition.

The disease for which the operation is recommended, are destruction of the kidney from suppuration resulting from any cause; or tuberculosis, if confined to one kidney; or cysts otherwise incurable; for the removal of solid tumors developing in this organ, and for such injuries as are followed by a persistent and incurable fistula; or which absolutely destroy the organ itself, such as gun-shot wounds.

The solid growths which we find developing in the kidney are, rhabdo-myoma, adenoma, papilloma, carcinomata and sarcoma; the sarcomata and rhabdo-myomas occur oftenest in infancy or childhood. Adenomata and carcinomata are growths oftenest found in adult life. Sarcomata develop very rapidly and grow to a large size. Their removal is attended with many difficulties, and even if not primarily fatal, does not add materially to the patient's tenure of life. The same is true with the carcinomata with the exception that they never attain a great size, because their malignancy leads rather early to a fatal issue.

Adenomata are simple tumors; can be removed safely, and the patient's life may be prolonged in comfort for years.

There are two methods of performing a nephrectomy: first, the lumbar; second, the abdominal. The lumbar is the one most commonly chosen; the operative manipulations are executed outside the peritoneum; free and perfect drainage is easily carried out; and for these reasons it is best adapted for cases of suppuration in the kidney, and all tumors of moderate size.

The abdominal method is of diagnostic value in enabling the operator to at once decide positively that both kidneys are present; it necessitates an abdominal section, hence opens the peritoneal cavity—and no drainage can be practiced unless a counter opening is made through the loin. It is best adapted to the removal of tumors of large size, as it allows perfect control of the growth. The dangers attending both operations are first, hemorrhage; second, infection; third, uremia from insufficient elimination of urine; fourth, shock.

Hemorrhage can be avoided by special care in the management of blood-vessels; sepsis prevented by the usual aseptic or antiseptic precautions rigorously carried out; uremia counteracted by elimination and derivation through other emunctories; and shock diminished to a great extent by free stimulation and protection of the patient from loss of body heat.

The lumbar incision for nephrectomy calls for exactly the same incision in all its details, as the one just practiced before you today, carried so far as to expose the tumor. After the organ is exposed it is loosened with the finger from its bed of perinephritic fat. As soon as this is accomplished, the blood vessels entering the hilus are carefully isolated and a needle armed with a double ligature of sterilized silk is carried between the vein and artery, through the pedicle made by these vessels, dividing it into halves, and it is securely tied. The ureter is then sought after, temporarily secured with forceps and divided between them. The pedicle is then cut through, sufficiently far away from the ligatures not to endanger their security, and the kidney is removed.

In cases of suppurating kidney, the organ is often so firmly imbedded in vascular adhesions that bleeding is dangerously free during its separation. If this be the case it is best to ligate the main vessels first.

After the removal of the organ, the ureter may be managed in either of two ways. Its free end is made thoroughly aseptic by the application of the actual cautery or pure carbolic acid, and it is drawn out and fastened to the most dependent part of the external wound; or its extremity may be inverted into its lumen, like the finger of a glove, and the perintoneal edges fastened by sutures.

Quite large and vascular growths of this organ can be safely removed through the lumbar incision, by first securing the base of the mass with a temporary rubber ligature, drawn tight enough to close the blood vessels. The tumor is then cut away piecemeal without bleeding until it is so far reduced in size that the permanent ligature may be easily applied inside the rubber tube, in the usual manner. The elastic tube is then removed.

Some operators include the ureter and the blood vessels in the same ligature, but the better plan seems to be to tie them separately.

If no pus is present, the wound is perfectly closed after providing for drainage by means of a large size drainage tube. If pus is present, the wound is best treated by the iodoform tampons as already described and illustrated to you to-day.

The dangers of this operation are increased by opening the peritoneum, and this accident should be carefully avoided.

When the abdominal method is practiced, an incision is made through the linea semi-lunaris in the usual manner common to all operations which open the peritoneal cavity. The intestines are pushed out of the way by means of a large flat sponge.

As the tumor is behind the posterior layer of the peritoneum, this layer, too, must be incised before the tumor is exposed. The colon, in these cases, usually lies on top of the tumor, and the incision which opens the posterior layer of the peritoneum should be made some distance away from the outer edge of the colon and parallel to it. It must be of sufficient length to allow the operator to have complete control of the tumor, and to provide for its easy removal. The sponge is then withdrawn; and the inner edge of the incision of the posterior layer of the peritoneum is sewed securely to the inner edge of the incision through the abdominal walls; in this way shutting off completely the peritoneal cavity from the field of operation. The blood vessels entering the tumor are now sought after and ligated. The ureter is found and secured temporarily by forceps, the tumor separated from its attachments and removed.

It is just as well if the tumor is rather large and the space limited, to secure the blood vessels temporarily by long-jawed forceps, as they can be ligated inside of these after the removal of the tumor.

It seems best to always provide for drainage through the posterior lumbar region; this can be easily done and without fear of hemorrhage by thrusting a pair of scissors directly backwards to the interval between the last rib and the crest of the ilium and expanding their blades to make an opening through which a large drainage tube can be easily drawn.

The ureter is managed in either of the ways that have already been described in the directions for lumbar nephrectomy.

After the tumor it removed and the manipulations mentioned are satisfactorily carried out, the edge of the posterior layer of the peritoneum which was sewed to the abdominal wound is unfastened by snipping the sutures. The sponge is again used to keep the intestines out of the way while the incision in the posterior layer of the peritoneum is secured closely by means of the continuous catgut suture, thus perfectly isolating the peritoneal cavity from the large space recently occupied by the tumor. The abdominal wound is sutured in the usual manner, the sponge removed, and the external wound closed.

Nephrorrhaphy is the name given to the operation practiced for the relief of the symptoms accompanying a freely movable kidney.

It has only been during a few years past that the profession has adopted the belief that any operation is required for the cure or attempted cure of such cases. It is possible that it can be justly said that it is only within a few years that the condition of a movable kidney has been recognized as the cause of a certain array of symptoms which interfere materially with the health and comfort of a patient suffering with this affliction.

Such patients as have come under my care have complained of quite serious trouble and have shown well marked evidences of failing health. All of them have become aware of the presence of the movable body and have insisted that the movements of the organ were the cause of much pain, at times even severe, and that the stomach was disarranged in its function—that the appetite was either lost or very much impaired—and that they had lost flesh noticeably and rapidly.

All of these cases had borne children—no doubt the condition occurs oftenest in women who have borne children, still the condition is met with in men.

We know that normally, the kidney is not absolutely fixed in its position—that it is movable to a slight extent in its surrounding loose cellular tissue. For some reason or other after extreme distension of the abdomen its mobility becomes increased in these cases, occasionally to a considerable degree; a true meso-nephron is developed, at the end of which the organ has a range of motion in proportion to the length of the peritoneal fold. Probably such cases as possess a complete meso-nephron are the ones in which the severest pain is felt; which may be due to a twisting of the vessels and the ureter.

In some cases the kidney can be displaced downwards as far as the ilium, or inwards as far as the median line. It moves upon the slightest touch, and can always be replaced into the position in the back which it properly occupies.

The well known shape and contour of the movable kidney can usually be readily palpated with the fingers through the loose and flabby abdominal walls, and hence as a rule can be positively differentiated from any other growth.

If the kidney is only movable in the loose post-peritoneal fat, even if the area of motion is considerable, the operation for its relief is much more simple than in the cases in which the kidney is invested on all sides by the peritoneum, and has a long meso-nephron developed from this tissue.

In the first condition, probably a nephrorrhaphy will bring about a cure; in the latter, probably a nephrectomy will be required if any operation is demanded.

Most often the kidney is normal in every way except its freedom of displacement. At times it is diseased and enlarged, and this may necessitate the more radical operation. The long mesonephron makes it very difficult or quite impossible to uncover the posterior surface of the kidney for the application of sutures without opening the peritoneum, an accident to be avoided. This condition greatly increases the difficulty of finding or fixing the organ at the bottom of the wound made to expose it.

The prognosis as to the operation is favorable—in the matter of permanent cure it should be guarded. The operation has not been done often enough, the cases subjected to operation have not been sufficiently long under observation in all instances, to enable us to speak very positively about them. In my experience, they have all been noticeably improved at first, the appetite has been better, the food better assimilated and the pain relieved. But this favorable result followed during the confinement of the patient in the recumbent position, with little or no disposition to displacement or interference with the organ.

It remains yet to be seen whether the adhesions formed as the result of the operation, are sufficiently firm to withstand the weight of the organ and the influence of the movements of the body, when the patient assumes the erect position and performs ordinary duties.

It is quite fair to mention the fact that quite a number of cases have been reported by surgeons, in which, even after a lapse of two years, there has been no return of the displacement, and the general health of the patient has been permanently benefited. The primary incision for nephrorrhaphy is exactly similar, in all details, to that already illustrated, to you to-day for exposing the kidney in the nephrolithotomy just finished. As soon as the peri-nephritic fat is uncovered, the kidney is found. Usually the assistant is able to fix the kidney in its normal position, by pressure against the organ through the anterior abdominal walls, so that it can be easily exposed to view by separating and displacing the surrounding fat. The posterior surface should be widely uncovered. Its capsule should then be incised for a length of two inches, and the edges of the divided capsule stripped off the surface for a short distance in opposite directions so as to uncover the small portion of corticle substance. Then the edges of the elevated capsule should be sutured with silk to the edges of the deep portion of the external wound. The needle should be full curved with a blunt edge, and it should be introduced so as to take up a fair amount of the kidney substance. It should be introduced very carefully, as the kidney substance is very soft and brittle, and easily torn; the silk suture should be drawn carefully after the needle, and without any tension on the kidney, for it is easily torn through the included portion of the organ.

Sutures should be placed, at least, at the upper and lower ends of the opening in the capsule, and a third or fourth one may be applied near its center. When these sutures are satisfactorily in place, the external wound should be closed, as has already been explained and illustrated, except that a narrow strip of iodoform gauze is to be placed in the center of the wound, reaching from the exposed surface of the kidney to the outer surface of the body. This strip of gauze is left in position for some time, and is said to answer the excellent purpose of establishing a band of cicatricial tissue from the surface of the kidney to the outer surface of the wound, permanent in character, which acts powerfully in fixing the organ in position. In one case in which I adopted this plan, there remains in the center of the scar a deep depression, which draws the skin inwards, and is no doubt produced by the cicatricial track left by the gauze used in this way.

The external dressings, the same as those applied in the case before you to-day, are designed to keep the wound perfectly aseptic until the healing process is complete.

The wound stitches can be removed at the end of the week, when, if the case has followed a course free from infection, the wound will be found united. The deep stitches have given rise to no trouble in the cases operated upon by myself, and are left to take care of themselves.

The patient should be confined to the recumbent position for several weeks, so as not to interfere by dragging upon the newly formed and easily torn adhesions.

Some surgeons claim that they are able to control all the symptoms incidental to the presence of a movable kidney, without operation, by a properly fitting pad applied to the abdominal wall against the organ, after returning it to its normal situation, and holding the pad in position by a body bandage.

The operation of nephrorrhaphy is not a dangerous one, and further experience with it may give to it a definite and positive position among the surgical operations upon the kidney.

NEPHRECTOMY.*

Last July I received a communication from a friend out of the city, stating that a patient had come under his charge who had been suffering for two years with cystitis, the diagnosis being based upon pus in the urine.

When I returned from my vacation in September, I found the patient awaiting me at one of the hospitals in the city. Upon examination it was found that a tumor could be easily palpated in the right side of the body beneath the ribs, large enough to extend down to the superior spinous process of the ileum, and reaching up to the hypogastric region below the liver. Upon the usual attempts at palpation and percussion, the dullness over the tumor was found to be continuous with the dullness of the liver. But the tumor appeared to me to be so elastic as to present some of the characteristics of a sac containing fluid. So I introduced an aspirator needle into it, and as was expected, found pus. As it presented none of the usual symptoms of a perinephritic abscess, it was diagnosticated to be a case of suppurative disease of the kidney communicating with the bladder through the ureter, the bladder being the outlet of the pus. There was no apparent disease of the bladder itself, other than that which would be present as a consequence of the foreign substance in the bladder.

Obtaining the patient's consent to an operation, an incision was made over the tumor to the outside of the erector spinæ muscle, and the tumor was exposed; then the pockets of pus in the organ were located by the hypodermic syringe. On this occasion, three pockets of considerable size were opened, and drainage tubes introduced. About a pint of matter was let out. It was decided that these three pockets, that were found by introducing the syringe in different places, did not communicate with each other; they were separate cavities, and I think that is the usual condition found in this sort of disease of the kidneys.

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* Read before the Chicago Medical Society. Nov. 7, 1887.

One of them opened freely into the pelvis of the kidney, so that through the incision that was made the finger passed into the pelvis, and water injected into this went into the bladder, showing that there was a direct communication from this cavity of pus to the bladder and urethra. The drainage tubes were left in and the patient improved promptly, losing the fever and symptoms of pus accumulation and retention. For two weeks the improvement continued, then it was noticed that she began to fail rather rapidly and to show signs of fever again; there were signs of septic accumulation, and the tumor began to increase in size, so that from diminishing, perhaps half the size when first examined, it increased one-third. As she was failing and the diagnosis was as complete as it was possible to make it, it was decided to perform nephrectomy.

There are some points of importance in the case: The drainage tube that went into the pelvis of the kidney gave free exit to quite a quantity of urine. I think that most of the secretion from that kidney came through the drainage tube; it was sufficient to wet thoroughly in two or three hours a large dressing; this dressing was sufficient to keep the discharge from the wound pure so that there was nowhere decomposition of pus so far as the outward manifestations were concerned. It struck me that if this drainage tube from the diseased kidney gave exit to such an amount of urine, and at the same time there was a good flow of urine from the bladder, it was a fair indication that the other kidney was not diseased, and that success would attend the removal of the diseased kidney, and it was decided to do the operation.

Sixteen days ago the operation was done. The patient was prepared in a certain way that I have followed in reference to all patients upon whom I do what is considered a serious operation, and I think it has a certain influence in preventing shock. Two or three hours before the operation is performed the patient is given gr. v. to x. of quinine, and gr. ¼ of morphine. This medicine was administered to the patient of whom I am speaking, and the operation for the removal of the kidney was performed. The whole proceeding from beginning to end occupied an hour, and she went to bed without any manifestation of shock, and with a pulse of 112. She had no rise of temperature until the second day, and then it rose to 100 degrees, subsequent to that it fell to normal and did not rise above normal until the twelfth day, when other symptoms appeared. During all this time the wound was absolutely aseptic. It healed promptly by first intention, so that on the seventh day all stitches were removed; the wound was solid from one end to the other.

There are some points about this operation to which I desire to call your attention, and I will pass the specimen around to show the nature of the trouble. You will see at the lower end a cavity, which was found to contain six or eight ounces of pus; there is another cavity in the interior of the kidney, the pelvis is entirely destroyed and filled up with adventitious material.

Here was an operation to be done upon a moderately sized woman for the removal of a tumor containing pus, a tumor which reached up under the ribs, down to the crest of the ilium, and forward to the anterior spinous process. There was a tumor containing pus in which large pockets had formed—what was the best way to remove it? There is no question in my mind that the best operation, in general, for the removal of the kidneys is the posterior operation. However, there are many diseases for which this operation is done where it is impossible to do it in another way than by the anterior operation, such as cases of cystic degeneration where the tumor is so large that it cannot be extruded posteriorly, but here was a tumor of moderate size, containing pus, in which it was desired above all things to avoid getting into the peritoneal cavity, a tumor which had sacs, the walls of which were in moderate degrees of thickness and strength, but could easily be broken open on pressure.

Therefore, the day before the operation I took a cadaver and experimented upon the lines of incision which would best expose this tumor and give exit to it. I finally decided upon the incisions represented in Figure 1. This represents the patient lying upon the opposite side from the diseased kidney. In these experiments I found that by a certain incision I could get the amplest room without doing injury to the colon or peritoneum; certainly no more likely to injure the colon, the peritoneum or other contents of the abdominal cavity than in an operation for the exposure of any of the large blood vessels of the abdomen.

It is hardly necessary for me to state that there is some little difference between subserous tissue in the lower portion of the abdomen and that of the upper. In the lower portion it is very loose and easily separated, whereas at the upper portion it is quite thin and the peritoneum is more apt to be torn, hence more care should be used in an operation in this position. The commencement of the incision is supposed to be two inches above the anterior superior spine of the ilium. It is carried in a curved direction downwards and backwards to the tip of the last rib. The incision is carried through all the tissues, down to the fascia transversalis, everything is carried forward out of the way, and with the finger the dissection can be made, well behind the tumor; all the parts are separated, then a straight incision is made through all of them, straight back from the first incision and half way between the crest of the ilium and the last rib. The introduction of a ligature at the point of the posterior flaps, and pulling aside, gives a wound one can get both hands into, and by exposing the kidney in all its parts, reach the tissues which one wishes to have under control, without difficulty. (Figure 2.)

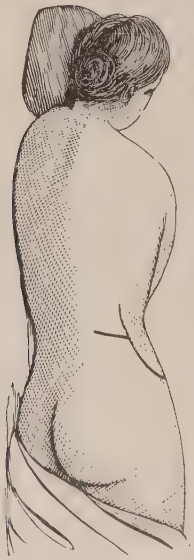

Figure 1.

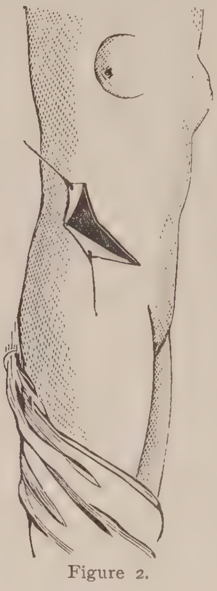

Figure 2.

In this case as soon as the incision was made the tumor presented itself, the finger could be carried around it in all directions so that the kidney with its blood vessels, ureter, and all were well exposed to view.

I desired to adopt the plan, which is a good one to adopt in all tumors that are difficult to reach, of dimininishing the size of the tumor, and attempted to divide it in halves by the cautery, but after a few strokes of the knife I approached a pocket of pus, and gave that up for fear of infecting the wound. I had very little difficulty by taking an eyed probe, threaded with a stout double ligature, in passing the probe through the center of the pedicle, and then with the double ligature ligating it in halves. The ligatures controlled the circulation perfectly. The vessels in the exposed stump were picked up and ligated one by one as a special security. Drainage was perfect, and the anterior wall of the peritoneum fell easily into place and united by primary intention. At the end of a week there was nothing left of this large cavity but the track of the drainage tube.

This case is an important illustration, it seems to me, of the safety of the posterior incision for tumors of considerable size, where the line of incision is carried out, somewhat in the way here indicated. The saddest part of my report is to come: Four days ago this patient was taken with symptoms of cerebral trouble and suppression of urine, and she died with all the symptoms of uræmia this afternoon at 1 o'clock, sixteen days after the operation. As yet a satisfactory examination has not been made to determine the condition of the opposite kidney, neither has there been a satisfactory microscopic examination of the tumor. Several sections have been submitted to examination, but none have shown the bacillus of tuberculosis.

The post mortem examination showed a highly congested and swollen organ in the remaining kidney; the capillary vessels were ruptured in many places.

HYDRONEPUROSIS.

Harry B., 3341 Wood St., age 8, American.

Ten weeks ago this boy was run over by a wagon, and now he has a large tumor in the abdomen. It was first discovered two weeks after the injury as a swelling as large as two fists in the right hypochondriac region. It has increased rapidly of late and causes much discomfort to the little patient by pressing upon the surrounding organs and by displacing them. It is confined to the right side of the abdomen, is even and smooth, and is a typical tumor in which to feel an impulse known as fluctuation. It concerns the kidney or the liver. If this were a cyst of the liver, there would be other symptoms in connection with it before this time. Cysts of the kidney often follow accidents. In these cases there is a closure of the ureter and a dilatation of the pelvis of the kidney. We have here a case of hydronephrosis, from injury to the right kidney or to the ureter.

We have frequently discussed this subject so thoroughly that it is not necessary to say anything further about it now.

We will introduce a trochar into this cyst from the lumbar side, remove the fluid completely and apply a pad anteriorly to take the place of the swelling which has been removed by the tapping.

In case the cyst should refill, this treatment may be repeated, and if found inefficient after several trials, the cyst may be permanently drained by enlarging the opening and inserting a drainage tube.

If the ureter is permanently occluded a permanent urinary fistula may remain in the course of the drainage tube, which will heal only after the removal of the kidney, or the re-establishing of a patulous ureter.

Nephritic Abscess.

A little more than two years ago this patient began complaining of pain in the left lumbar region, and had trouble in urinating. About that time a physician examined the lumbar region, and believing that it contained matter, made a small opening which has remained a suppurating sinus ever since. At the time of the operation a considerable amount of pus was evacuated through the bladder. The patient was undoubtedly suffering from a nephritic abscess, and the matter passed down the ureter into the bladder, and thence out through the urethra. In the region of the left kidney I can feel a distinct mass which seems to fluctuate a little on deep palpation. So I think it is reasonable to suppose that we have some trouble with the kidney, the exact nature of which, of course, we do not know. The patient excretes a fair amount of urine in twenty-four hours, which now contains a quantity of pus. Not only has the patient discharged pus, but she has passed three calculi of brown color, one-fourth to three-fourths of an inch in length. What we propose to do is to open to the seat of the disease and ascertain the exact nature of the trouble. I see now oozing from the sinus a slow discharge of pus. I shall follow along the course of the director in opening this abscess. If I were going to open directly down to the kidney without regard to the sinus, I should, perhaps, make a different opening from the one I am making now. I have now gotten into the cavity of the abscess, and find that it extends up as far as the twelfth rib; I have as yet found no connection existing between it and the kidney. Introducing the hypodermic needle in the direction of the director, I find that it enters another pus cavity in the substance of the kidney, so the abscess is in the kidney itself. Now, I shall follow along the director with these forceps, in the same manner that I did with the aspirator, and when they have entered the cavity I shall open them, enlarging the opening into the cavity so that I can introduce my finger. I now have my finger in the cavity of the abscess of the kidney, and I am unable to find any foreign body. This outer abscess is a secondary trouble arising from this abscess in the kidney. I find that the substance of the kidney is very much broken down. I feel trabeculæ running across the surface, and the separation of the parts is not so perfect as it should be. I can feel all parts of the cavity with my finger and I am satisfied that it does not contain a calculus, but I will scrape out the granulations which it contains. You see that they are very dark and unhealthy looking, as you would expect to find them after being present so long. I should have felt better if I had found a calculus in the kidney; but it is impossible to find what does not exist. I find that this is a condition which is very common; it is a multiple abscess cavity. I have broken it down as nearly as I could into one cavity, and we will pack it with iodoform gauze. This will not prevent hemorrhage, but will cause a healthy surface. It should be left in about seventy-two hours, then a drainage tube is inserted, and thorough irrigation every day will lead to a rapid cure. You see from the amount of gauze that goes into this cavity that it is as large as a hen's egg. I will pack the abscess cavity above the kidney separately.

CHAPTER IV.

TUBERCULOSIS.

THE PATHOLOGY, ETIOLOGY AND TREATMENT OF HIP-JOINT DISEASE.*

Pathology. Following the publication, a few years since, of the experimental researches and the deductions therefrom, made by Professor Koch, of Berlin, with reference to the introduction and develpment of the bacillus of tuberculosis within the human body, has come the belief that hip-joint disease is directly and absolutely the result of the changes produced in the joint tissues by the irritation and growths caused by the presence of this bacillus; therefore the name of tubercular degeneration is now used to express the manifestations incidental to the presence and progress of this affection of the hip joint. It is a disease of common occurrence, and frequently leads to very great destruction of the joint elements, often having a fatal issue.

The great variety of the manifestations of the presence of the disease in the joint is dependent upon the variety of the component elements thereof, any one of which may furnish the primary focus of its onset. Hence there has been a corresponding diversity of opinion as to the tissue in which the disease exists primarily, some surgeons asserting that its frequency of commencement is first in the synovial membrane; others in the capsule; others in the ligamentum teres; and still others, constituting the largest majority, contend that its primary manifestation is in the development of a tubercular ostitis in the head of the femur or the cancellated bone tissue at the bottom of the acetabular cavity; the same principle holding true here as elsewhere in the predominance of epiphysial affection. The examination of a large number of specimens after resection of the hip joint favors the supposition that an ostitis, resulting from the implantation and development of the bacillus tuberculosis in the cancellous tissues of the bony elements of the joint, is the starting point of this disease most frequently by far, in children at least. In adults the synovial membrane of the joint is often the first tissue to be affected, leading to distinct and regular changes, such as thickening, loss of function and tissue degeneration. Thickening, from infiltration, cell proliferation and tubercular growths; loss of function, in painful and limited motion and hyper-secretion with over distention of the joint and consequent loss of its normal landmarks; tissue degeneration, showing formation of granulations and fungus outgrowths on the internal surface of the synovial membrane and interference with local circulation, marked by whiteness of the skin covering the joint and the arborescent ramification of dilated superficial veins.

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* This lecture was delivered by the late Professor Parkes before his class at Rush Medical College in October, 1890, six months before his death.

The changes in the tissues, when ostitis marks the onset of the disease, are exactly similar to those occurring in inflammation of bone from any source. These will be hyperemia, rarefication of bone spaces, absorption of calcareous matter, softening, liquefaction; and added to these there will be the formation of a cheesy deposit, tubercles and granulation tissue. Such changes cannot occur without absolute interruption of circulation in the blood vessels of the bone itself over greater or less areas, leading to destruction of bone in small particles, termed caries, or in larger masses, termed necrosis. If necrosis results in consequence of this cutting off of the arterial supply the peculiar distribution of the arteries of the bone near their extremities quite frequently leads to the production of a triangular or cone-shaped fragment of dead bone, the base of which is directed towards the joint surface. The extent of the caries or necrosis will depend upon the degree of development of the bacilli and the changes they produce after infection, and the consequent amount of interference with the vascular supply of the bone concerned in the disease.

Such changes as we have indicated cannot occur without leading to well-marked evidences of interference with the nutrition of many tissues in the immediate neighborhood of the disease process. The cartilages of joints are dependent entirely for their nourishment upon the looped arrangement of blood vessels in the bone tissue immediately beneath them and to which they are attached; hence very soon, accompanying the bone changes, the cartilage covering the head of the femur or lining the bottom of the acetabular cavity is deprived of its nutrition, is separated from its bony attachments by the growth of granulations beneath it, and becomes necrotic; its surface, perforated here and there by the pressure of subjacent granulations, finally is loosened entirely or broken into many fragments, and its debris will be found floating in the fluid discovered in the joint when it is opened. Its condition of partial or complete destruction depends entirely upon the degree and severity of the disease or the length of time this disease has been in progress.

If the infection includes or progresses so as to attack the synovial membrane, this membrane is doubled and more in thickness; its polished surface is destroyed, and in lieu thereof is found a covering of soft, velvety granulations, sometimes present in such abundance as to constitute real fungosities. Their integrity is easily destroyed and the destruction is accompanied with profuse bleeding, a condition called by older writers fungous degeneration of joints.

Again, this synovial tissue may be necrotic in many places, rough, irregular upon the surface and dirty in appearance, according as the progression of the disease has led to greater or less disturbance of its vàscular supply, and hence of its nutrition. This amount of disturbance varies from a condition which leads only to a constant over-distention of the joint with serum, either natural in color or slightly bloody, with or without flakes of lymph floating in the fluid, or to one which causes an accumulation of turbid fluid filled with the products of destructive action upon the granulations or the joint tissues. If pus infection is added to the disease already present the capsule may be filled with pus as well.

The distension of the joint with fluids quite frequently leads to rupture of the capsule at its weakest points and dissemination of its contents into surrounding parts; hence the tubercular abscesses which approach the surface gradually, showing fluctuation and pressure changes of the skin covering them, and indicating the necessity for incision.

The head of the femur presents much diversity of form as the result of the changes produced in it by the ravages of the disease; it is apt to be much softened and its substance more or less destroyed by liquefaction and absorption of its tissue, so that many times nothing but a short portion of the neck remains continuous with the shaft. If the onset of the disease be close to the epiphysial junction of the shaft, the epiphysis is not infrequently destroyed at once, is separated from all its attachments and is discharged or removed entire as a necrosed fragment.

Pathological changes similar to those already mentioned occur in the joint as the result of the commencement of the disease anywhere in the bony walls of the acetabulum; when commencing there the disease is not infrequently accompanied with a perforation of the acetabular cavity towards the pelvis, with the formation of abscesses bulging into the pelvic cavity.

The direction which the contents of the distended capsule take after its rupture is entirely accidental, and depends upon the site of the rupture in the capsule and the arrangement of the layers of fascia covering the joint and investing the soft parts into which it ruptures. Sometimes it projects upwards and forwards towards Poupart's ligament, and the fluctuating swelling there formed opens spontaneously or by incision above or below that ligament. In the latter case, usually indicating acetabular disease. Again, the pointing may be downwards and inwards at the apex of Scarpa's triangle, or outwards at the edge of the tensor vagina femoris muscle, or backwards upon the posterior surface of the thigh. I have on two occasions opened abscesses originating from hip-joint disease which showed the indications of pointing only when they reached the external condyle of the femur.

When the operation for excision of the joint is done early in the progress of the disease the pathological changes in the joint surfaces themselves may be so slight as to be scarcely recognizable, yet a longitudinal section of the fragment removed often shows the foci of tubercular degeneration in spots of cheesy matter, also the formation of tubercles and granulation tissue with corresponding bone destruction.

A large accumulation of fluid filled with the detritus resulting from this disease may approach the surface in its progress, may be incised and its evacuated contents have much the appearance of the pus accumulation in ordinary abscesses, although noticeably white in color and cheese-like in character; yet cultures made from this fluid will fail to produce any of the different pus microbes. Still, you must remember that in the progress of this disease pus infection is particularly apt to occur with well-marked increase in the inflammatory symptoms attending the disease.

Etiology. The causes of the disease are, first, predisposing; second, exciting. *a*: Predisposing—hereditary: A very large number of these cases furnish a history of tubercular disease in several members of the patient's immediate or remote family, so that there can be scarcely any doubt but what the special vital power which the patient receives from his progenitors has a certain influence on its occurrence. Yet it must be remembered that he who is compelled to associate with individuals already suffering from some manifestation of tubercular disease is in great danger of infection. This peculiar disposition to the occurrence of manifestations of this special disease in members of the same family is said to depend on the "tubercular diathesis." This, to me, means only that it occurs most frequently in the weakest and most debilitated individuals, hence in those least likely to resist any hurtful influence with which they may be surrounded, and who, above all, are unable to prevent the development of and the ravages incident to the presence of the bacillus of tuberculosis when once it gains entrance into the circulation and secures lodgment in the tissues of the body.

It has been proven that almost without exception the tissues found in chronic arthritis in any of the joints of the body, when subjected to microscopical research reveal the presence of this bacillus, and that these tissues upon being introduced into the body of a healthy animal lead to manifestations of tuberculosis. The bacillus taken from the tissues of such a joint, can be grown into colonies if furnished with the proper culture medium, and when injected into the tissues of a healthy animal they will produce a like disease, so that we are bound to believe that there is a direct relation between the cause and effect—the cause being the presence of this bacillus, the effect being the manifestations of changes in the structure of the joint tissues.

Exciting cause. Trauma: Many facts seem to support the assertion that the bacilli, always found present when the disease is in a state of activity, remain latent in the system until their development is induced by the occurrence of any trauma sufficient to disturb the nutrition of the part in which the disease is to be developed, this disturbance of nutrition seemingly establishing all the conditions necessary to rapid growth of the bacilli and the development of the many changes in tissues incidental to their presence.

The hip joint and the spinal column constitute parts of the body very likely to be the seat of trauma resulting from the incessant activity and slight local injuries so often occurring in children, hence the great frequency with which the disease is found located in these portions of the body and in early life.

The diagnosis of the affection is based upon the well-marked symptoms which outline its course. The consideration of these symptoms should always be preceded by careful and minute inquiry into the patient's family history. This inquiry not only furnishes the attendant with a fair estimate of the patient's vitality, but also the probable source of the infection.

Familiarity with and an acute perception of the earliest symptoms indicating the disease places the patient under the charge of the surgeon at a time when the adoption of remedial agents will often enable him to stay entirely the progress of the disease, or to control its ravages, to the extent of securing for the patient relief with only limited disarrangement of function of the joint; whereas, if left to progress to its later stages of advancement, relief, whatever the treatment adopted, must be somewhat problematic.

Symptoms.—*Lameness:* Among the first symptoms to appear is lameness, beginning with a scarcely perceptible limp, perhaps not even noticeable while the child is at play, progressing insidiously as the disease advances, to become a constant and uncontrollable condition. Early in the disease the lameness is most noticeable when the limb is first used after a night's rest, or when it has become slightly stiffened after rest, following constant use during the day. The cause of this lameness is in part the inherent tenderness of the inflamed tissue; but it is oftenest caused by the weight of the body bringing the surfaces of the joint in contact or by making pressure upon the inflamed areas of bone beneath the joint surfaces.

Pain: During the later stages of the disease the exquisitely sensitive joint surfaces cause the slightest movements in the joint or the support of any weight to be extremely painful. The patient involuntarily, from the very commencement of the disease, puts all of the joints of the affected extremity in a state of slight flexion in order to lessen shock of any kind transmitted through the extremity to the joint; hence he flexes the ankle, the knee and the hip; and however slight this flexion may be, if it is maintained, a limp will be the result in any attempts at walking. The greater degree of flexion the more marked the lameness, and hence this symptom becomes a valuable index to the extent of the disease.

The amount of pain complained of varies greatly in different cases. Where present from the first it is an indication that the nature of the trouble in the joint should be carefully inquired into. Yet there are many cases remarkably free from this symptom; absence of pain does not, therefore, by any means always indicate the absence of the disease. A large majority of cases at first, and sometimes throughout the entire course of the disease, refer the pain to some portion of the knee joint, especially the inner side.

When a patient suffering from the lameness already described complains of pain persistent or interrupted, referred to the inner side of the knee, suspicion is always awakened as to the likelihood of this pain in the knee being dependent upon disease in the hip joint, and induces an especially careful examination of the case. This pain is supposed to be reflex in nature and dependent upon the fact that the hip and knee joints receive their articular branches from the same nerve trunk, and the irritation of the nerve ends distributed to the hip joint is reflected to those of the knee.

A very noticeable attendant of hip disease is the special pain termed "startling pains" or "night pains," so called by being accompanied with the sudden contractions of the muscles of the limb and the body in general, startling in the suddenness, and from the fact that they are especially apt to occur at night after the child has fallen asleep. The startling pain indicates that the disease in the joint has reached an advanced stage; has progressed at least to the point of the formation of granulations, which are exceedingly tender and sensitive. During waking hours the fixation of muscular contraction prevents movement of the joint, avoiding pressure upon these granulations, but as soon as sleep relaxes these contracted muscles the joint surfaces fall together, awakening the patient by the excruciating pain produced; the patient moans and cries out with a sudden starting of the entire body; the muscles are forced into sudden contraction, and the patient again falls asleep. These symptoms recur from time to time until the disease has progressed so far that the destructive changes themselves prevent the pressure which produces the pain.

Fixation: Another symptom marking the presence of the disease is fixation of the joint in some abnormal position by the contraction of the muscles of the joint. This contraction of muscles in confirmed cases not unfrequently becomes contracture, with actual shortening of the muscles, and hence permanent fixation of the limb in positions of deformity. The fixation is supposed to be dependent upon reflex stimulation of the groups of muscles concerned in its production.

Many cases are accompanied with severe pain upon the slightest movement of or jar to the affected limb. The patient's attention is constantly directed to the protection of the joint from disturbance of any kind on account of the suffering caused thereby. The position of the limb is never changed without the foot of the diseased extremity being supported by the foot of the sound limb. Again, some of these patients seem to have learned that slight extension of the diseased extremity is of service in relieving the pain, and, of their own accord, they attempt to accomplish this result by pressure in the direction of extension made by the sound foot against that of the diseased limb.

Deformity: The deformity first present is that of flexion, abduction and external rotation. The depression of the pelvis which accompanies this change in position of the thigh is necessary in order to bring the limbs parallel with each other during walking; it produces also an apparent lengthening of the limb.

Later in the disease the deformity present is that of flexion, abduction and internal rotation. In order to make the limbs parallel after the occurrence of this deformity the pelvis is elevated, and as a consequence there is an apparent shortening of the injured limb. This apparent lengthening and shortening of the extremity is accompanied with a corresponding depression or elevation of the anterior superior spinous process of the ilium on the diseased side, caused by means of a tilting of the pelvis to one side or the other.

The lengthening is always apparent, the shortening may be either apparent or real. It is always real, although at times moderate in amount, after the destructive processes of the disease have led to a rupture of the *ligamentum teres* and partial displacement of the head of the femur from the acetabular cavity. When this ligament is destroyed the powerfully contracting muscles force the head of the bone against the upper and outer portion of the brim of the acetabulum and against the corresponding part of the capsular ligament, leading to pressure changes and necrosis at these points.

The shortening is real and extreme in cases in which the pressure against the capsular ligament destroys it and allows the head of the bone to be entirely dislocated from the acetabulum. Such extreme cases are not of frequent occurrence, but they do happen. In the case of a little boy operated upon by me not long ago, the disease had been exceptionally rapid in its progress and the deformity was extreme. Incision in that case showed that there was not only absolute dislocation of the joint, but also that the formation of a new acetabular cavity had commenced about the head in its abnormal position. The shortening is real also in all cases in which there has been absolute destruction, softening and absorption of any considerable portion of the head of the bone.

As the limb is fixed in a position of flexion of a greater or less degree, when the knees are equally extended the thigh of the diseased side carries the pelvis forward, producing a noticeable flexion forward of the lumbar vertebræ, termed *lordosis.* This condition is found as a symptom of other diseases, such as Pott's disease, infantile paralysis or congenital dislocation of the hip joint, and hence needs careful inquiry to establish the real cause of its presence.

Muscular Wasting: Cases of hip-joint disease seldom fail to present, in some period of their progress, the symptom of muscular atrophy, or wasting. This is, of course, partly dependent upon their want of use, yet is so extreme in degree or marked in its results that it must have other causes for its occurrence; among these is the existence of absolute atrophic changes in the muscular fibres, probably incidental to trophic disturbances resulting from nerve irritation; it leads to loss of contour in the joint and obliteration of landmarks; the gluteal muscles become flattened, the inter-gluteal fold changed in direction, and the muscles themselves become flabby.

The shortened and contracted muscles about the joint resist any motion therein, and stand out under the skin as rigid cords upon any attempt being made to change the position of the limb, any such attempt being acompanied with extreme suffering on the part of the patient.

Swelling: In the later stages of the disease swelling occasionally becomes a symptom for consideration; the deformity thereby induced being dependent on the accumulation of fluids upon one or another aspect of the joint, following the progress of destructive changes in the joint itself, and marking the site of the accumulation with resulting abscesses. Not infrequently these cases are accompanied with enlargement of the lymphatic glands on the anterior aspect of the joint.

General Debility: Cases of hip-joint disease seldom progress far without displaying well marked manifestations of debility and loss of general health; the countenance carries ineffaceable evidence of suffering, and soon shows, by its pallor and by wasting of the general body, unmistakable symptoms of faulty or insufficient assimilative powers. The appetite becomes capricious, may fail entirely, and in extreme cases is followed by great emaciation throughout the body. The entire extremity of the side diseased is much smaller than the healthy one, and the contrast is very evident upon comparison.

COMPLICATIONS—*Abscesses:* Formation of abscesses is of frequent occurrence, as a complication of hip-joint disease, and when the attack is sudden, always indicates infection with pus microbes as an addition to the disease already present. Their onset is accompanied with great increase of the signs of inflammatory action, as shown by high temperature, increased pain and tenderness, chills and sweats.

Reference is not here made to accumulation of purely tubercular matter and debris which may exist in considerable quantity without any of these symptoms, as is shown in similar accumulations occurring in different parts of the body, termed "cold abscesses."

The occurrence of the symptoms mentioned as indicating the development of acute abscesses is soon followed by fluctuation in the swelling produced, necessitating incision for the purpose of giving exit to the pus, or if left to itself it will open spontaneously and the pus be discharged. In either case after the contents are emptied, the opening remains patulous and shows little disposition to heal, although the walls of the abscess may fall together, and its cavity so far diminish in size as to leave only a long tortuous tract, termed a "sinus." The sinus will be kept open and give exit to a persistent discharge of matter in greater or less amount, because of the presence of the dead bone or other necrotic tissue in the diseased joint.

In old cases of hip-joint disease it is not unusual to find a number of minute openings discharging pus on different aspects of the limb and widely removed from the joint,

General Tuberculosis: A very serious and fatal complication of hip-joint disease is the occurrence of meningitis, or general tuberculosis. These complications not unfrequently are developed immediately after an operation, such as excision for the relief of the disease; the operation seemingly introducing the bacilli into the general circulation, thus acting as a direct cause for the metastasis in the meninges or other internal organs of the body.

Amyloid Degeneration: Cases in which the suppurative process has been extreme or prolonged over many months, or even years, are sometimes accompanied with an amyloid degeneration of the liver and kidneys. The following case of a little girl ten years old, admirably illustrates this condition. She had suffered for several years from prolonged suppuration following tubercular degeneration of the lumbar vertebrae and right hip-joint. with almost numberless sinuses traversing both sides of the body. The enlargement of the liver was so great in this case as to fill nearly the upper half of the abdominal cavity, its lower edge reaching quite to the umbilicus; the deformity produce was very remarkable and extensive. The liver in these cases usually returns to its normal condition, if by any course of treatment the suppuration can be caused to cease entirely. It is not a condition which militates against operative interference.

Ankylosis: Usually the fixation in disease of the hip depends only upon muscular contraction and contracture, and hence constitutes a false ankylosis, which disappears partially or completely during anæsthesia.

In many cases of prolonged existence of the disease, the head of the femur and acetabular cavity are immovably joined together by the development of bone, forming a true ankylosis. In such cases the femur and the os innominatum move as one piece of the skeleton, and the deformity present cannot be changed in the slightest degree, even under anæsthesia without the application of force sufficient to break the bone or the performance of an osteotomy.

Both hip joints are occasionally the seat of tubercular disease at the same time or within short periods. The condition of the patient under such circumstances is truly lamentable; to walk is quite impossible even early in the manifestations of the disease, and even though treatment has stayed its progress, or quieted entirely these manifestations, the resulting deformity very often makes the act of walking a great labor. A case in point is that of a young man twenty years of age, who, when eleven years of age became afflicted with double hip-joint disease. Both hips became ankylosed in a position slightly beyond a right-angle, and the legs crossed so that one knee was in front of the other. Locomotion was possible by throwing first one hip forward, which act carried the corresponding leg to the front; as soon as the weight of the body was on this foot the other hip was swung forward, and by this alternating, half-rotary, motion he succeeded in walking short distances. In this case an osteotomy was made on both extremities at the same time, cutting through the bone with a chisel just below the trochanter major. As soon as the bone was severed the limbs were easily extended and placed in a position of abduction and external rotation; they were kept in this position by the use of Buck's extension, and at the end of eight weeks the fractures were firmly united and his previous deformity was overcome. This case was one of old hip-joint disease, hence the deformity was flexion, adduction and internal rotation. To overcome the malposition it was required to make extreme extension, abduction and external rotation. Notwithstanding the fact that the disease had existed so long, muscular contraction offered no resistance to complete extension, not a single tendon required division, but the skin immediately over the anterior surface of the joint cracked in several places under the tension to which it was subjected.

EXAMINATION OF THE PATIENT: In order that a satisfactory examination shall be made, it is absolutely necessary in all cases to remove all of the patient's clothing; especially is this desirable to enable the surgeon to detect the earliest manifestations of the disease. It is scarcely necessary to claim that the earlier the disease is detected and the more promptly remedial agencies are adopted the sooner and the more certainly will relief be given to any case coming under inspection.

The minutest alteration of the joint or limb in position or contour, or in its movements, should attract attention and be made the subject of careful and exhaustive inquiry as to their cause and meaning. The absolute confidence of the patient should be secured by every means possible before and during the progress of the examination. Above all things, gentleness in examining is especially desirable. If possible avoid all movements which are likely to give rise to pain. If movements must be made likely to induce pain the patient should be notified of that fact, so that the patient's fortitude may be aroused to bear it. By care in these matters even the youngest of patients can be subjected to a thorough examination at least sufficiently satisfactory to elicit the presence or absence of the well-known symptoms which accompany the disease.

It is necessary that the limb, in doubtful cases, should be carried through all the motions possible in the joint and to their extreme limits, and also that each motion should be compared with the corresponding one of the sound limb. In the early manifestations of the disease it is only when approaching the extreme limit of any motion under trial that the halt or evidence of partial fixation or pain will be elicited. In cases in which the disease is more advanced the changes in contour, in loss of freedom of motion and pain will be easily determined, and do not require any roughness of handling to demonstrate their existence.

The patient should always be placed on the back on a perfectly even and smooth table, with the spine held close in contact with the table. First, try whether or not the popliteal space of each limb can be brought in contact with the table without producing any curvature or lordosis of the lumbar region of the spine; if this can be done no deformity of flexion has taken place. If the deformity of flexion has commenced as soon as the popliteal space of the injured limb is brought in contact with the table there will be produced a curvature forwards of the lumbar region of the spine, because the fixation of the femur in the position of flexion compels the os innominatum to tilt forward. By relieving the pressure from the knee and allowing the back to again touch the table, the thigh will again be flexed and give the exact angle of fixation.

In the trial of all these motions the anterior-superior spinous process of the ilium should be observed to ascertain whether it remains motionless during any of the movements to which the joint is subjected; it should not be influenced in the least. If motion is communicated to it during any of the trials it indicates that there is limitation from some cause or other to the special movement under inquiry. In this careful way compare adduction, abduction and rotation in the sound and diseased extremities.

In all cases in which this disease has made considerable advance the amount, extent and kind of deformity should be carefully estimated, for it is only by an accurate knowledge of each of these conditions and of the causes which produce them that one can hope to put into practice the proper remedial procedures necessary for their relief.

PROGNOSIS. The length of time the disease has been in existence, the amount of deformity already present, the general condition of the patient, the occurrence of suppuration are all items to carefully consider before prognosis is given; the degree of severity manifested in either or all of these conditions adds greatly to its gravity. To promise a complete cure is ever unwise, no matter how early the disease is recognized or subjected to treatment; every case is followed by some degree of deformity or debility in the joint. It should always be remembered that in cases in which treatment has been followed by seemingly perfect results, foci of tuberculosis may still remain latent in or about the joint tissues, likely to be stimulated to fresh activity by any trauma sufficient to disturb the circulation in their neighborhood; indeed this relighting of the disease not infrequently happens after cases in which complete excision has apparently relieved all sources of trouble.

DIFFERENTIAL DIAGNOSIS. Affections stimulating hip-joint disease are not of infrequent occurrence. Among them may be mentioned superficial abscesses in any of the tissues surrounding the hip-joint. The acuteness of their onset and rapidity of progress will usually furnish valuable items leading to their recognition. Like all tubercular affections, hip-joint disease is comparatively slow in its manifestations.

Abscess under the iliac muscle gives rise to flexion and partial fixation of the joint. Psoas abscess has its previous history of spinal fixation and deformity. Pure synovitis from traumatism has a much shorter history for its development as a distinguishing peculiarity. An almost insurmountable difficulty is offered in cases of osteomyelitis affecting the epiphysis of the upper end of the femur, and the only special symptom belonging to this affection that is at all distinguishing is the remarkable suddenness of the onset of an attack of osteomyelitis with its accompanying rapid inflammatory changes.

TREATMENT—*Natural Cure.* Like most other diseases in the human body, hip-joint disease shows a tendency to limitation in its progress by the natural powers of the system. When this occurs it follows usually as the result of the suppurative process with the formation of abscesses, ulceration of their coverings, elimination of their contents and the discharge of the necrotic bone. If the destructive action of the disease is not extensive this result is accomplished by the natural powers alone, all the sinuses heal completely, the process of cicatrization destroys or isolates the cause of the disease, and the case is cured; usually with some permanent deformity resulting.

The special treatment to be adopted for the relief of any case of hip-joint disease depends upon and is regulated by the condition ascertained to be present after a careful examination of the case. In all cases absolute rest to the joint must be secured. All special appliances used have the accomplishment of this object in view. Recognizing the fact that there is an ever-present tendency to deformity, its prevention by every means at one's command constitutes also another item of consideration in any plan of treatment adopted.

If relief comes as a result of treatment it will not occur even in mild cases without many months, and perhaps years, of careful attention.

General and Medicinal Treatment. The general hygienic surroundings of the patient should be the best possible to obtain; abundance of fresh air and sunlight can certainly be secured, and personal cleanliness should be insisted upon. Food must be regulated according to the patient's power of assimilation—easy of digestion and rich in fats. It is the testimony of experience that all tubercular patients avoid the hydro-carbonaceous foods if allowed to have their own choice. Cod liver oil or butter administered with ale or malt are always supportive to the patient's vital powers. The dose of cod liver oil should never exceed one teaspoonful three times a day; given in larger quantities it is not absorbed and does harm. Some of the preparations of iron and the bitter tonics are found useful in many conditions of the general system accompanying the progress of the disease. The special condition of the patient will furnish the indication for their administration.

The presence of pain from any source frequently necessitates the use of some preparation of opium to subdue it; but this pain being oftenest dependent upon the pressure of the joint surfaces against each other, it will be most certainly relieved by the use of some appliance which will obviate such pressure.

During the earlier manifestations of the disease, counter-irritation over the surface of the joint by means of the application of cantharides, or heat, or cold, gives temporary relief to many of the painful symptoms accompanying its onset.

Treatment is of two kinds—conservative and operative. The conservative treatment has for its object the application of such dressings as will provide rest to the joint and at the same time overcome the already exisiting or prevent entirely the occurrence of the deformities which attend the disease. All of the various plans secure extension in order to keep the joint surfaces as widely separate from each other as possible, and they may be divided into portable splints and fixed apparatus. The first allows of some motion in the joint and general movement of the body, and the second secures either absolute fixation of the joint or positive confinement in the recumbent position.

The plan suggested by Hutchinson is considered by many as very efficient and particularly applicable to the treatment of the disease in its earlier stages. In it the shoe of the sound limb is raised by a sole two inches in thickness, and the patient required to use crutches ; the diseased limb is thus allowed to swing free, and is prevented from coming in contact with the ground, the weight of the extremity thus acting as the extending force.

Fixation of the joint is better accomplished by the use of Thomas' splint. This consists of a band of steel a quarter of an inch thick and one inch wide and long enough to extend from the inferior angle of the scapula to a point just above the heel of the diseased limb ; it is bent so as to fit accurately into all the natural curves of the body on the diseased side while the body is in the erect position. It is padded throughout its entire length and secured in position by a broad band surrounding the body, a second band surrounding the thigh, and a third one surrounding the leg towards its lower end. If now the patient is elevated by means of a thick sole on the shoe of the sound limb, and advised to use crutches, this splint constitutes a very efficient means of fixation of the joint, the patient at the same time securing the full benefit of moderate exercise in the open air.

A third plan, adopted by many, consists in the use of some modification or other of Taylor's splint, which consists of a bar of steel made in two pieces with a ratchet attachment between them near the knee, to allow of extension. It is secured firmly at its lower end by a steel plate fastened to the sole of the shoe at its upper end, which reaches to the crest of the ilium ; it is fitted to the middle of a well-padded cross bar of steel curved to correspond with the shape of the crest of the ilium. The attachment of the upper end of the splint to the cross bar is in the shape of a ball and socket joint. The extremities of the cross bar are perforated for the purpose of attachment of the perineal band, which is fitted in the crease of the perineum on the side of the diseased hip. The splint is secured to the limb by means of a well-padded band surrounding the upper part of the thigh, a second surrounding the upper part of the leg and a third fastened about the leg just above the ankle. When fastened in position along the outer side of the diseased extremity, and the perineal band in proper place, the ratchet attachment permits a considerable force of extension to be produced and at the same time allows of motion in the joint and general exercise of the body.

Thomas' splint is certainly a very satisfactory appliance to make use of for protection against injury in cases in which other treatment, which will be suggested, has led to a cessation of the manifestations of the disease, especially as a means of prevention of shock to or strain of the joint when the patient first commences to take exercise. Personally, I have had no satisfactory results follow the use of either of these appliances in anyway equal to those obtained either by the application of Buck's extension and confinement to bed, or the plaster cast and the use of crutches. Absolute fixation of the joint can be obtained by making use of the plaster cast ; when used it should be so applied as to cover the entire extremity as well as the hips and body for some distance above the diseased joint. The ordinary plaster bandage, made of crinoline into the meshes of which plaster of Paris has been spread, is the best material to use. All portions of the body covered by the plaster bandage should be thoroughly padded with cotton batting before its application, as well should the diseased limb be held in forced extension, abduction and external rotation and securely maintained in this position until the plaster has hardened. Many cases under my care have been treated satisfactorily with this appliance; deformity prevented, pain abolished and health restored.

No more efficient or satisfactory means of treatment in the majority of these cases can be instituted than that of Buck's extension. This is very simple and easily applied. It requires confinement to the bed on the back, yet I have never seen any ill effects attend its use. The most excruciating pain and the agony of night startings is almost immediately relieved after its proper application with sufficient weight. The occurrence of deformity is prevented and that already present is surely overcome. These results far outweigh the ill effects supposed to be caused by the confinement. It has been my experience, as well as that of many other surgeons, to constantly witness improvements in every way secured by the adoption of this plan of treatment. Its success is in main obtained by always making the extension in thedirection of the deformity which is present. At all times during its use care should be had that the spinal column is in close contact with the bed on which the patient lies—that no lordosis is present. The shoulders also should be in contact with the bed, and the patient secured in this position by a broad bandage extending over the chest and under the arms and fastened to the bed; the head can be slightly elevated by the use of a small pillow. The bottom of the bed should be so far raised as to certainly secure the weight of the trunk as a counter extending force. Broad strips of adhesive plaster are fastened to the inner and outer sides of the diseased limb, reaching as high as the middle of the thigh and some distance below the foot; they are secured in position by the ordinary roller bandage. The lower ends of the plaster are fastened to the ends of the usual spreader to prevent pressure on the malleoli. The rope used to carry a proper amount of weight is attached to the middle of the spreader and carried over a pulley which is already fixed in a movable upright attached to the lower end of the bed, in a direct line with the diseased extremity. The pulley should be placed at such height as to allow of the extension being made in the direction of the existing deformity of flexion. The amount of weight used should be about one-twelfth of the entire weight of the body, and never sufficient to cause dragging pains in the groin. As the constant traction of the weight overcomes, as it surely will, muscular contraction about the hip, the pulley is lowered from time to time in accordance with the degree of improvement in the deformity of flexion until complete extension is permissible in the diseased limb without the occurrence of any lordosis.

If severe deformity of adduction be present it can be overcome by the use of the weight and pulley adjusted so as to act at a right angle with the thigh by means of a plaster band fastened around the lower end of femur. The dressing should be kept on, or reapplied if not acting efficiently, until all pain is relieved and free motion is permissible in all directions. If the disease has progressed to any noticeable extent this result will not be secured short of one year's time.

Operative Procedures. First under the head of operative procedures are to be considered injections into the joint of a 10 per cent. emulsion of iodoform in glycerine. The iodoform treatment certainly possesses a remarkable curative effect upon tubercular degeneration in any of the joints in the body. In my hands it has proven more satisfactory in staying the progress of the disease and leading to a disappearance of the results and repair of its ravages than any other remedy or treatment that has been suggested. If the capsule is distended with fluid this should be emptied by the introduction into the joint of a good sized trocar, it being understood that the puncture is preceded by all the usual aseptic and antiseptic precautions with which you are familiar. After the fluid is emptied out through the canula, or its introduction has not been followed by the discharge af any fluid contents, from two to four drachms of the emulsion is thrown into the joint by means of a syringe and caused to be disseminated all over the joint surface by manipulation and free passive motion of the joint after the canula is withdrawn and the puncture opening protected by a pad of iodoform gauze. Some care must be used in the amount of force to which the weakened capsular ligament is subjected by the pressure of the distending emulsion for fear of rupturing this membrane followed by the exit of the fluid into the surrounding cellular tissue. This can always be easily regulated by fastening a piece of soft rubber drainage tubing about four inches in length to the canula and fitting the syringe into the free end of it. As long as there is not much pressure upoh the fluid it passes through the rubber tube without difficulty. As soon as the joint becomes over distended a well-marked bulb is formed in some portion of the length of the tube, the character of which is a sure indication as to the amount of pressure which is being made upon the capsule by the emulsion.

My experience has not shown any constitutional effects from this use of iodoform, except in one case, and that was a little boy afflicted with tubercular degeneration of both knee joints and one ankle joint. I injected all three joints at the same time, and this was followed by quite well marked evidences of iodoform poisoning, lasting over two days. After two injections all evidences of the disease have disappeared with the exception of deformity in the position from muscular contraction.

It has been asserted, upon good authority, that this injection is very satisfactory as well in cases in which the degeneration has gone so far as to lead to the formation of sinuses—a cure following its use without any other operative procedure. Even in cases so badly diseased as to be relegated to amputaiion, its use has been so satisfactory to me that I am ready to assert that no tubercular joint should be subjected to any open operation until a fair and exhaustive trial has been made of this emulsion of iodoform. It has not been found necessary to make the injection oftener than once in two weeks.

Operations: Cases are often met with presenting considerable deformity in which the surgeon is at once compelled to decide as to the advisability of forcible replacement of the limb in its normal position, especially cases in which the active processes of the disease have ceased, leaving such deformity.

Focible replacement js not to be undertaken hastily, for the traumatism accompanying such procedure often starts the disease again with apparently increased fierceness of action. When anæsthesia proves that the fixation is neither from bony ankylosis nor severe muscular contraction, by steady and yet quiet force the limb may be restored to its normal position. If contracture is extreme it may be necessary to practice subcutaneous division of the tendinous portion of the muscles offering greatest resistance. As soon as the limb is restored to its normal position it must be retained in that position by the application of a plaster of Paris cast already described or by the use of Buck's extension. These appliances should be kept in position until all tenderness or other evidence of inflammatory action has disappeared from the joint.

In performing tenotomy about the hip-joint aseptic and antiseptic precautions should be observed, and the division of the muscles should be made through the tendinous portions, carefully avoiding all important blood vessels and nerves. Occasionally the principal obstacle to extension is produced by contracture of the fascia lata of the thigh. This fascia constitutes the main element of resistance ; it should be divided by an open incision of triangular shape, the base towards Poupart's ligament and the apex towards the middle and some distance down the thigh. As the limb is extended the edges of the incision are widely separated, and this extensive wound can subsequently be closed by suturing together its lateral edges.

The formation of abscesses frequently require surgical interference, and they may either be treated by aspiration with subsequent over-distension with the iodoform emulsion already mentioned or by free open incision. If by open incision the contents are thoroughly evacuated by means of the scoop, and the cavity irrigated with a 1-3000 solution of bichloride of mercury or a solution of tincture of iodine in water strong enough to have the color of sherry and either packed with iodoform gauze to the bottom or drained with a drainage tube.

Old sinuses resulting from previous abscesses can sometimes be made to close by repeated injections of the iodoform emulsion or the injection of a 10 per cent. solution of chloride of zinc. This result is not likely to be obtained when their existence is dependent upon the presence of necrotic tissue in the diseased joint. Under such circumstances, and perhaps in the majority of cases, cure will oftenest follow the plan of laying them open freely throughout their entire length, curetting their walls, and then thoroughly scrubbing the resulting cavity with a 1-1000 solution of bichloride of mercury, after which they may either be closed by proper sutures introduced throughout the principal portion of their length to a point in close proximity to the joint, or the entire cavity packed with iodoform gauze and allowed to granulate, or closed by secondary sutures four or five days after the first operation.

Any necrotic tissue found in the joint must be removed, even to the extent of excising the remnant of the head of the bone if this is found to be totally destroyed.

In many cases the excision of the head of the bone will constitute the starting point of the operation, the full opening of the sinuses and their treatment as directed accompanying that procedure. Frequently the sinuses follow such a course in their tortuosity or depth as to endanger the large blood vessels of the thigh, thus preventing the surgeon from laying them wide open. Under such circumstances these important structures must not be injured, but the sinuses should be thoroughly curetted and rendered aseptic by the use of the antiseptic fiuids recommended.

Osteotomy: Bony ankylosis following old hip-joint disease is not infrequently met with, either with the presence of sinuses or without any external openings leading to the joint, and requires for its relief a division of the bone, together with a tenotomy of the contracted muscles if these offer any resistance to the replacement of the limb in its normal position after the bone is divided.

The instruments necessary to perform an osteomony are a scalpel and a key-hole saw or a mallet and chisel. The point of division of the bone may be either through the neck of the bone or through the shaft just below the great trochanter. If the key-hole saw is the instrument used for dividing the bone the external incision is short, only sufficiently long to admit of the easy entrance of this very narrow bladed saw. In this operation for the purpose of dividing the neck of the bone the scalpel is thrust through the soft parts just above and in front of the tip of the anterior border of the great trochanter and carried firmly to the neck of the bone, all the tissues being freely divided in its course; after its withdrawal the saw is carried along the track thus made in front of the neck of the bone, which is sawed through from before backwards and the limb placed in a normal position. When the saw is used to divide the trochanter major the scalpel is thrust through the soft parts directly down to the femur just in front of the edge of the tensor vaginæ femoris muscle, and at a height corresponding with the contemplated line of section. After the bone is exposed by the incision with the knife the saw is introduced into the opening and carried in front and over the inner surface of the femur, and that bone is sawed through in a direction from within backwards and outwards. After the division of the bone the limb is placed in the position desired. An ordinary carpenter's chisel suffices for the purpose of dividing the bone in these cases. When the chisel is used to accomplish this result the point chosen for the severance of the bone is feeely exposed by an incision with the scalpel through all the soft parts covering it. This incision should be long enough to allow of the introduction of the chisel through it to the bone surface, and then to permit the cutting edge of the chisel to be tured in a direction transverse to the long axis of the bone. The chisel is then driven through the bone in different directions by blows of the mallet until entirely severed or sufficiently weakened to be easily fractured by the application of slight extending force, after which the limb is carried into the position necessary to overcome the deformity and the wound closed by sutures. If contracted muscles resist replacement of the limb to its normal position after any of these operations they must be subjected to subcutaneous division. All these operative procedures must be proceded, accompanied and followed by the most perfect attention to every detail of aseptic and antiseptic preparation, care and treatment of the parts operated on, of the wound and of the subsequent dressings.

Excision of the hip joint for tubercular disease thereof is an operation frequently performed and sometimes followed by lasting relief to the patient with a very useful limb. When performed very early in the manifestations of the disease before much destruction has resulted from its action, the operation is promptly recovered from and the limb possesses correspondingly greater usefulness; but even when done thus early the operation does not always secure permanent relief from the disease, for many such cases have subsequently come under my care for the treatment of tubercular abscesses, persistent sinuses re-forming in the course of the scar, or developing in some previously unaffected portion of the joint tissues. If excision is to be followed by the longest periods of relief from disease and to secure the most useful limb, it must be done before the ravages of the disease have led to any extensive destruction of the joint elements; when done thus early the operation can be made an absolutely aseptic one, and be followed by rapid primary union of all the tissues incised with scarcely any constitutional reaction. Although many times remarkably rapid recoveries follow excision of the head of the bone, accompanied with the removal of the diseased acetabular cavity and other tubercular tissues, even after suppuration has occurred with resulting sinuses, still the probabilities of a successful and satisfactory result are greatly diminished by the presence of any such complications; the operation is far less likely to be aseptic on account of the almost insurmountable difficulties attending the purification of the sinuses and the uncertainty of complete removal of all tubercular foci. It is my belief that the persistent use of the iodoform emulsion in these bad cases will make them much more amenable to successful treatment in the future. The instruments necessary to perform excision of the hip-joint are a scalpel, probe pointed bistoury, one pair of dissecting forceps, one pair of heavy scissors, two retracting hooks, half a dozen artery forceps, a periostome, a chain saw or a straight saw with a movable back, or a chisel and mallet and needles with silk or catgut for application of ligatures or sutures. It is always well to have a Paquelin cautery ready for use in case it is desirable to destroy any tubercular tissue which cannot be otherwise removed. No better incision for exposing the joint can be made than the ordinary straight one or one made with a slight curve backwards over the situation of the trochanter major. The incision should commence at a point about two inches above the middle of the upper border of the trochanter major and terminate about an inch below the junction of the trochanter with the shaft of the femur; it should be carried with a free hand through the gluteus maximus muscle and through the periosteum of the exposed trochanter. The deeper portion of the incision should be inclined forward to correspond with the forward and inward direction of the neck of the bone; divide the capsule of the joint and uncover the neck and head. If the disease has not made much advance, by means of the elevator the periosteum should be stripped off from the trochanter in all directions, carrying with it its muscular attachments, and in this way bring into plain view all portions of the neck, head and trochanter. In all cases it is the rule to carefully save every particle of the periosteum unaffected with tubercular degeneration, as by this means are preserved the muscular insertions and a much stronger and more useful limb insured.

In many cases the disease has so far progressed in its infiltration and destruction of the surrounding soft parts that it will be necessary to divide the muscles attached to the trochanter by means of the probe pointed bistoury in order to surely remove all the diseased tissues. It is best not to make any effort to extrude the head of the bone through the incision until after the trochanter has been perfectly freed and the capsule entirely separated by one or other of the plans just described. As soon as this is accomplished the head of the bone is readily forced through into the external incision by forcible adduction and backward pressure, using the thigh as a lever. The diseased bone is now separated from the shaft by the use of either of the saws mentioned or the chisel and mallet. My preference is given to the use of the chisel and mallet for this purpose, for with them it is possible to regulate accurately the amount of bone removed and accomplish its removal without any injury to the surrounding soft parts. In advanced cases it will usually be found necessary to include the trochanter major in the segment of the bone removed. In very early cases it may be found permissible to remove only the head and neck, and this can sometimes be done without any disturbance of the tissues attached to the trochanter major. There is considerable danger of fracturing the weakened shaft of the femur during efforts at extrusion of the head of the bone unless all of its attachments have been loosened before any such attempts are made. This fracture has occurred so often during these attempts that many surgeons advise and practice the plan of dividing the bone *in situ* without any efforts at extrusion, lifting the diseased fragment out of its bed after its severance is accomplished.

After the removal of the segment of bone the acetabulum should be examined for evidences of disease. Any granulations found present should be removed by means of the scissors or curette, and if the capsule of the joint is affected with tubercular degeneration it should be dissected away in part or in whole in accordance with the degree of degeneration present. Sometimes the destruction of manifest tubercular degeneration of the soft parts can be best accomplished by the free use of the Paquelin cautery.

If any arteries are divided during the incisions described they are temporarily controlled with the artery forceps and permanently secured by the application of ligatures.

The limb is placed in a position of extension with slight abduction and external rotation. If the case is an old one the sinuses are treated as has already been described, and the wound thoroughly irrigated with a solution of 1-2000 bichloride of mercury or the solution of tincture of iodine in water. The external wound can be treated in either of two ways. It may be packed throughout to the bottom with iodoform gauze and partially closed by a suture, or it may be closed entirely by sutures, except at the point used for the exit of large drainage tubes introduced in such position as will provide for free outflow of the wound secretions.

If the case be a very bad one with many sinuses and much suppurative action I prefer the treatment by iodoform gauze packing, permitting the wound to heal from the bottom by granulation, or applying secondary sutures, to be tied about the fifth day, upon removing the packing.

In either case the usual external antiseptic dressings are applied and the limb maintained firmly in its normal position by the application, outside of the dressing, of the plaster cast or the use of Buck's extension. The necessity for subsequent dressings of the wound will depend entirely upon the presence of disturbance therein, as indicated by the rise in temperature—the less often disturbed the better. The external appliances for maintaining the limb in its new position should be retained for sometime after the wounds have entirely healed, and the use of the limb forbidden until all tenderness at the seat of the operation has disappeared. It is advisable to apply Buck's extension at night for at least one year after the wound is healed.

The indications for hygienic and medical treatment, such as have already been advised, should be assiduously fulfilled throughout the entire course of treatment.

Results of the Operation: After excision this extremity is always considerably shortened, and if the head, neck and trochanter have been excised the parts remaining are not such as to result in the formation of a very serviceable joint. Besides, if the destructive action be so great as to require such an extensive excision, the parts concerned are very slow in healing, and oftentimes the resulting sinuses never heal at all or remain open for years. Occasionally, owing to the continuation and extension of the disease, an unseemly deformity produces an absolutely useless limb. It is certainly a question whether the majority of limbs after excision are as serviceable to the patient as the attainment of ankylosis of the joint, with the limb in the extended position. It is even advisable to maintain extension for a year after all symptoms of acute trouble have disappeared in order to allow of complete condensation of cicatrical tissue, to diminish the degree of shortening, to avoid deformity and to provide for firm fixation of the shaft of the femur in its new position. This result can be accomplished by the use of Buck's extension with sufficient weight during the night, allowing the patient to take the usual amount of exercise during the day time.

Amputation: Cases which have been subjected to little or no treatment and which have been allowed to progress for years, with the extension of the disease to the os innominatum and shaft of the femur, and accompanied with much burrowing of pus, should be subjected to amputation of the hip-joint. With the improved methods to absolutely control hemorrhage, and the present technique of the operation, amputation for the relief of this disease is not attended with more, if as great, mortality as excision. It promises most relief because it removes the mass of the diseased tissue and allows of free and perfect drainage, and furnishes a ready method of accurate application of remedial measures to the remaining evidences of disease. Best of all an amputation puts a stop at once to the immense drain put upon the constitutional power of the patient, resulting from an extensive suppurating cavity.

Amputation of the hip-joint will be required in some cases as a secondary measure for deformity after excision, or for the relief of such cases as are not followed by satisfactory cicatrization of the cavity left and the closure of the accompanying sinuses.

Amputation is best made after the plan of Mr. Furneaux Jordan. It consists in making a circular amputation of the thigh at a proper distance below the hip-joint. After the circular amputation is completed the blood vessels are permanently secured with ligatures; the remnant of bone left is then dissected out of the stump through an incision carried from the top of the trochantermajor to the end of the fragment, along its outer side.

The bleeding vessels are positively and absolutely controlled by carrying a rubber band across the perineum and over the pubis in front, and behind the trochanter and over the crest of the ilium posteriorly. The rubber is pulled as tight as possible and the ends crossed where they meet above the crest of the ilium and then carried to the opposite side of the body and securely held by an assistant. A firm pad is placed beneath the rubber across the course of the external iliac artery in such position as to actually close that vessel; it should be held securely in proper position by an assistant. Or the plan advised by Dr. Wyeth can be followed with perfect safety—pass an upholsterer's long needle through the soft tissue on the inner side of the thigh on a level with the lesser trochanter; a similar needle is carried through the tissues on the outer side of the thigh, between the trochanter major and the ilium. The needles should be long enough to project at least two inches beyond the soft parts at both ends; protect the points of both needles with pieces of cork. Encircle the thigh above the pins with a sufficient number of turns of a rubber bandage to control all the vessels. The circular amputation of the thigh is now made, first forming a skin flap which is to be turned up as far as possible; then a circular division is made of the muscles as high up as the knife can safely be carried, and the bone sawed through. All vessels are now permanently ligated, the rubber band removed and the remnant of bone dissected out of the stump. No blood whatever will be lost while the rubber band remains in position, if either of the above methods are properly executed. In my experience rapid and unexpected recoveries have followed amputation of the hip-joint for bad cases of hip-joint disease.

Tuberculosis of Bodies of Vertebrae.

Mary K., 1079 Jackson St., Age 17 months.

The parents first noticed some trouble with this little childs, back about three months ago. As it lies on its father's knee with its back exposed, you notice a marked convexity of the dorsal vertebrae. The little one does not walk nor stand, so we cannot illustrate the accompanying symptoms. There is a disposition toward the softening and compression of the anterior portions of the bodies of the vertebrae in this part of the dorsal region, and consequently the spines become more prominent. Hence we have a case of beginning tuberculosis of the spine; formerly termed Pott's disease of the spine.

Now, the child does not walk, I am inclined to advise the parents not to have a cast applied but to put the child upon its back in the same manner as you would in hip-joint disease and allow it to remain in this position until it is able to walk, then the back should be supported by a plaster-of-Paris cast. The child should have a light, cheerful room, plenty of good wholesome food, half a teaspoonful of cod-liver oil three times a day, and if it will drink it, a little ale or beer; in short one should do all that can be done for its general nutrition.

TUBERCULOSIS OF ANKLE JOINT.

Case 5. Samuel W., Listant, Lasalle County, Ills., Age 12, American School boy.

This little fellow came to the hospital last night. He has been troubled with his ankle for four years. I have no doubt but that he is suffering from tuberculosis of the joint. It shows that the ligaments of the ankle joint have been absolutely destroyed by the inflammation. What we propose to do is to lay it open freely both on the front and inner side and remove all the degenerated tissue and put it to rest in a plaster-of-Paris cast. If this patient were an adult I should not hesitate to amputate the foot. But being a lad the chances are much more favorable.

I have seen them recover after the removal of the astragalus and perhaps the os calcis and then have a much better foot than any artificial foot which can possibly be made. I make the incision above the middle of the dorsum of the foot and extend it to the malleolus so as to make a free incision. The degeneration of the tissue is very great and I shall remove it very completely. With that one stroke of the hammer I removed almost the entire end of tibia. Now you will be surprised to see the boy come in here in the course of a few months with a good foot. I think the disease is confined to the bones of the ankle. The os calcis is not in a good condition to be sure. I put my finger behind the chisel to use it as a director and as a guard to the parts behind. There is danger of cutting the finger and care must be exercised to prevent it. You can see all the changes which we have described in the destruction of the bone tissue very nicely shown here in these bones. Portions of the astragalus-os calcis and cuneiform bones have been chiseled away. We will carefully curette away the granulations contained in all of the sinuses. This will all fill up with connective tissue, it will draw down and make the limb a little shorter, but it will be much more valuable than an artificial limb. This will be packed with iodoform gauze from both sides and all the sinuses leading to it will also be packed with iodoform gauze so that all parts will be aseptic. There is not much danger of septic infection if you remove all this material, the patient recovers without any rise of temperature. We do not irrigate unless there is an infected wound and then we use only the saturated solution of boric acid. Now you see that is very different from the way I have been in the habit of talking to you, but it is the result of personal experience, and hence it is to be remembered. The point is absolutely this, if you keep the microbes and all foreign matter out of the wounds you are able to get along without the assistance of any irritating fluids and the wounds will heal more rapidly.

Mrs. B., School teacher, 46 years of age.

This is the patient whose leg we amputated at the lower third for an extensive tuberculosis of the ankle, the tarsal bones being entirely destroyed by the disease. The destruction was so great that the ankle joint was composed of a caseous mass rather than of bone and the finger could be pushed directly through the tissues. Therefore amputation was the only remedy. The wound is entirely healed as you see ten days after the operation. It is a very interesting case in that, as you remember, we found the blood vessels occluded through their whole extent. The limb was atrophied throughout, giving rise to this condition of affairs. There was no pulsation of the arteries nor bleeding, even after the Esmarch's constrictor was removed. We have, therefore, in this case, an illustration of the destruction of the bony, muscular, nervous and all other tissues as a sequela of this disease.

In adults with such an extensive tubercular destruction of the ankle joint an amputation a little below the middle of the leg is to be preferred to a resection. This confines the patient to his bed for only about two weeks and gives him a stump upon which he can wear a very useful artificial limb. Patients who are subjected to an amputation for the removal of a tubercular joint usually gain very rapidly in weight and strength after this operation.

Charlotte O., Chicago, Age, 14, Swede.

Here is a typical tubercular ankle joint presenting all the characteristics which I have frequently pointed out to you. We purpose to open this joint and see what we can do for it. I shall make Professor Kocher's incision which I have described to you before, consisting in the straight transverse incision across the tip of the external malleolus, dividing the external ligaments, and bending the foot inward, so as to thoroughly expose the joint surfaces. It is not always necessary to divide the anterior and posterior ligaments, as the operation can often be successfully performed without so doing. When I cut into one of these tubercular joints and find it full of degenerated, broken-down tissues, I feel like amputating the foot above the seat of the disease. But again, when I go out on the street and meet a little schoolboy running along, with two good, sound feet, five years after having performed an operation on him for a tubercular joint as bad as this, I am encouraged in performing the conservative operation. You will thus meet both discouragement and encouragement. I was talking to a physician friend today about a little patient on which I operated for a trouble of this kind two years ago. He tells me that the little fellow is quite well, wears a shoe, and runs about without a limp. The many results of this kind that we see convince me that the conservative work is the thing to do, and to leave a portion of the work to nature. By removing all of the dead and dying tissues that you can, and at the same time leading to the occurrence of an inflammation which will cause the deposition of a large amount of cicatrical tissues, which continue to contract upon the diseased portions which were unavoidably left, you destroy by compression the comparitively few bacilli of tuberculosis which remain. This process is, you remember, very much assisted by the use of the actual cautery. If the disease has had its origin in the astragalus, the keystone of the arch of the foot, and proceeds in the direction of the toes, one authority goes so far as to say that, even though the other bones of the tarsus are not affected, he invariably amputates the foot. We will not say anything against this doctrine for he is a surgeon of high standing, but we will show you this foot later. We will now use the cautery thoroughly. You should uot use it hotter than a dark heat. If you get the white heat, it burns more than you desire, and does not accomplish any more. The white heat will cut blood vessels that are in the way the same as a knife would, and that, of course, should be avoided. You would think that there would be a fearful reaction from this operation, but such will not be the case. Without some accident, the child will progress to recovery without any rise of temperature.

This wound will be dressed and redressed in the usual manner and with the usual care.

This little patient has a simple fistula situated on the inner side of the tarsus, leading to an abscess cavity which I have no doubt contains a foreign body. And as that foreign body must be something originating in the body, I have no doubt that we shall find carious or necrosed bone. This diseased bone will be due either to the destruction caused by the bacillus of tuberculosis or the pus microbe: If due to the former the diseased condition is known as tubercular degeneration of the joint; if to the latter, it is termed osteomyelitis. I find that this small opening leads down to dead bone, and I make just enongh of an incision to uncover the seat of the disease. If I am able to relieve the trouble by shelling out one or more pieces of dead bone from this small opening, we will do so, if not, then we shall be compelled to do a more extensive operation. Sometimes we are compelled to take away the entire bone.

A little foot like this bears but little resemblance to the foot which you study in your anatomy. In fact the undeveloped foot is entirely different, because the progress of development or ossification has not been completed and in many cases has scarcely begun. By lifting out these pieces of bone, I find that I have removed the whole focus of the disease. So I think the little one will get well without any further treatment In all such cases you should not be limited in your operation except by the extent of the disease tissue. Having removed all of the infected tissues as we have done in this case, then the patient is ready to go on to recovery. The specimens of one which we have just removed, is of the same oseoparotic gelatinous character which fills up the spaces between the laminæ of bone and the soft parts surrounding the bone and which you have seen so often. All of this degenerated material must be removed with the curette. If this is thoroughly done and the cavity is dusted with powdered iodoform, and then packed with iodoform gauze, the case usually goes on to recovery without any further interference and without any reaction. You will never expect such results, however, unless you thoroughly carry out the instructions which have been given.

It is encouraging to be able, as we are nowadays, to take these specimens of bone and after carefully searching from time to time, find well marked foci showing the presence of bacilli of tuberculosis; especially is this true since so many diseases are traceable to this cause. We are indebted to Prof. Koch for the discovery and description of the bacillus of tuberculosis which is recognized as the cause of this disease. Hardly ever do we find tuberculosis affecting the diaphysis of the long bones. I do not say that we never find it, but it is very rare. It is usually found in the epiphyseal end of long bones or in that vicinity. If the disease comes on slowly and an abscess forms, you may know that the trouble is tubercular in character; but on the other hand, if the disease is rapid in its progress and inflammatory in character, you may know that it is osteomyelitic instead of tubercular.

Before dressing this wound we will wash it thoroughly with 1-1000 bichloride of mercury, for the purpose of disinfection.

This little patient has club foot, and has had a special shoe made which has been worn and which was supposed to originate this trouble. A careful examination would at once prove the incorrectness of that idea, for had such been the case there would have been much less destruction to the tissues. I think there can scarcely be a doubt that iodoform has a curative effect upon tubercular diseases. Just why this is, it is difficult to explain. But placed in a wound it comes in contact with moisture and perhaps separates into elements giving off free iodine which acts as a potent disinfectant. Be this as it may, iodoform has beneficial effects and this is why we use it, notwithstanding the fact that we read in the journals that microbes will develop and thrive in it. You must remember, of course, that the conditions are not the same in the two cases, consequently the argument is of no value, in comparison to your surgical experience conclusions drawn from experiments made in test-tubes cannot be safely applied to the human body.

I do not know that I have said anything in regard to the incision to be made in these cases. There is no regular rule in regard to the course of such an incision. It merely should be made in a direction leading to the avoidance of blood vessels, nerves and tendons, and with a free hand down through all of the tissues to the bone. I think this is better than trying to dissect the tissues separately, for you know that they are so changed and glued together that they form one tissue mass. Going through the periosteum, it can be lifted up out of the way and the chisel introduced without injury to the soft parts.

The iodoform gauze packing will be removed about once a week and reapplied with the same care we have exercised during the primary dressing in order to secure an aseptic healing of the wound throughout.

Tuberculosis of Knee.

Wm. C., Prinenwood, Shaweno Co., Wis., Age 25, American, Laborer.

This case gives the following history: His family history is good with the exception of the fact that his mother died of cancer, but I do not think that has anything to do with this case. The patient enjoyed good health until he had a fall, hurting his knee. This seemed to pass away without any serious results. About two years ago his knee was caught between two logs, and severely crushed. From that time to the present he has suffered constantly and has not been able to use the limb; the swelling which you see has increased gradually and the knee has been held in the position of slight fiexion. The case will show you all the characteristic appearances of white swelling. It is called white swelling because the skin is tightened over the part, shutting off the capillary circulation so that it is not so vascular as the rest of the skin. and you will see that the little veins are somewhat enlarged. The landmarks have been destroyed. The surface is smooth and even. The same is true of the ligamentum patella. As I examine the patella I find that I can depress it. This directs your attention to the fact that there is fluid below it. It is a case of tubercular degeneration of the synovial membrane. It is impossible to say whether the degeneration began from a focus in the bone, or the synovial membrane. It is more likely to occur in the former than in the latter, and we will probably find foci in the tibia. Of course the limb has been properly prepared in every way. Yesterday it was scrubbed with soap and water and then shaved and washed with a solution of bichloride of mercury, 1 to 1000, and then an antiseptic dressing was applied. This is useful from the fact that it permeates the pores of the skin and renders the micro-organisms in the skin harmless. Now, of course. I am not certain what I shall find, so I shall not promise as to what we shall do. If I find no disease of the cartilage and no very great disease of the bone all I shall do is to obliterate the joint by dissecting away the diseased synovial membrane, Now I have discharged from this joint a very disagreeable and unhealthy fluid. We give to it the name of tubercular pus. This pus shows that the joint is in a somewhat advanced stage of tubercular degeneration. Who would think from the external manifestations of this case, that the destruction inside was so great as this. The surface of the condyles of the femur are eroded. The cartilage is separated and falls off in pieces. I am afraid that I shall not be able to do better than to make a resection of the head of the tibia. I will dissect down to the healthy tissue, leaving the synovial membrane behind. You can see here a focus at the upper part of the bone that I have opened into. I have expressed to you my opinion for prefering the chisel for removing the diseased bone and I need not repeat. The sawed surface of the bone shows some signs of inflammation, yet I am satisfied that it is not the color of tubercular tissue. Here is a large pocket of pus in a great cul-de-sac of the synovial membrane. I shall lay this wide open for I am satisfied that we cannot control it unless we do this. This is the thickened synovial membrane. We shall remove as much of it as possible. Now I drill two holes through these bones, one on either side. which is easily done, and I pass this needle armed with catgut through these holes for the purpose of holding the surface in apposition until callus has been thrown out. The holes are made obliquely from a point three-fourths of an inch from the sawed surface of the bone to a point just below the posterior edge of the sawed section. Very frequently silver wires are introduced. Frequently instead of catgut surgeons use ivory pegs or steen nails, sometimes the drill itself is left in the hole for the purpose of fixing the fragments. But in my cases I have used the catgut. In the majority of cases the bones will stay in position with catgut or whatever material you may use. It does not last very long but it will not cut its way through the bone as the wire often does and it does not have to be removed. There is enough exudation to fix the parts held with catgut, provided external splints are applied, and especially if plaster of Paris splints are used. This external wound will be closed with the continuous catgut suture which has been antisepticised. These tissues are inserted through all the tissues. You will be able to learn much of the condition of the bone in this disease by examining these fragments.

James S., Chicago, Age 55, Merchant.

Gentlemen;—This is a case of old tubercular trouble of the knee-joint. It had been rather dormant for a number of years, but lately it has been giving the patient trouble. so we are injecting it with an emulsion of iodoform. The first time he was before you he was brought into clinic on the cart, not being able to get out of bed. Now, he is able to walk pretty well, after having had three injections of the 10 per cent. emulsion of iodoform in glycerine.

When he first appeared before you, his knee-joint was absolutely stiff, and caused him very great pain. Now, you can see that there is a very perceptible amount of motion in it and the pain has entirely left it.

Remember what I have told you in regard to attaching the syringe to the canula of the trocar with a piece of rubber tubing, as we have done here, as a guide to the amount of pressure that you are using. The amount of pressure which causes this bulb to form in the rubber tube will fill the capsule of the joint, yet it is not sufficient to rupture it. I am satisfied that the capsule is not infrequently ruptured by the application of too much force.

We must insert a trocar as large as a goose quill into the joint preferably into the space beneath the tendon of the quadiceps femoris muscle. If any tuberculous pus is present it is permitted to escape through this canula. The cavity is then irrigated repeatedly with a saturated solution of boric acid in warm water until the fluid returns perfectly clear; then the joint cavity is filled with a 10 per cent. solution of iodoform in glycerine. The quantity injected varies from one drachm to two ounces. This treatment is repeated once in two weeks at first until the irritation has subsided, which can be recognised by the fact that the characteristics of tuberculosis disappear. The fluid coming from the canula becomes less flakey and is viscid and the patient is able to use the limb.

Then the injections are repeated at longer intervals at first once a month then once in two and later once in three months.

In our experience it has required from 2 to 12 injections We employ precisely the same method in the treatment of all the other tubercular joints.

Apparently it is immaterial whether the iodoform is mixed with glycerine or with olive oil. If the former is used it is not necessary to sterilize the mixture provided it be prepared at least a week before it is used, because the glycerine will destroy any pathogenic microbes which may be present in the iodoform during this time. If oil is used the mixture should be heated in a steam sterilizer for one hour.

TUBERCULOLIS OF SHOULDER.

John M., Age 24, Joliet, Ill., Railroad employee.

Four months ago this patient received a jar affecting the shoulder joint. He was unable to continue his work but has noticed a certain amount of stiffness in the joint ever since. The shoulder has not been swollen to any marked degree and there has been no redness. During the past month the patient has noticed the development of a deformity which is now very apparent.

You see the difference between his shoulders. At first glance, if you are not accustomed to seeing injuries about the shoulder, it might suggest dislocation. It is flattened, as compared with the opposite side, but the flattening does not depend upon displacement. I am confident that it is a tubercular disease. There is no trouble that would come on as rapidly as this; no such evidence of injury as this history gives would lead to so well marked atrophy as is present here. No acute injury would lead to it, other than the presence of tubercular destruction of the ligaments, and perhaps the joint surfaces themselves. I can scarcely put the arm through any of the motions. The motion is not in the joint but in the scapula. What is to be done? Put this limb at rest and inject the joint for a short time with the 10 per cent. emulsion of iodoform. The arm should be carried in a sling fixed to keep it at rest. If no improvement follows, resection is the proper procedure. A resection of the shoulder joint is frequently followed by a very useful arm. The recovery is generally rapid. There is one point about the deformity to which I must call your attention; it is the prominence made here by the head of the humerus. You will notice it swings forward. This comes from the weight of the extremity throwing the head of the bone down and the swinging forward by the tendency of the fore arm. You will find also a projection on the anterior surface.

Here as elsewhere in tubercular joints the thickening is due to the condition of the ligaments, the periosteum and the tissues surrounding the joint and not to enlargement of the bone.

TUBERCULOSIS OF WRIST.

Wm. B., S. Halsted St., Chicago, 23 years old, Telephone operator.

Father died of pulmonary tuberculosis. Mother and sister healthy. Seven years ago patient began to suffer from pain and stiffness of the wrist joint after a fall. The progress has been very slow but constant since that time.

This patient is suffering from tuberculosis of the wrist joint. Yon notice the characteristic puffiness of the joint. He has had two injections of the iodoform emulsion, and he says this is the first time he has been able to extend and flex the fingers for six years. You can notice also that the amount of swelling in the joint is considerably dimished. He is a private patient, and I merely bring him before you to show you the result of this treatment.

I have had success in every case of tuberculosis of the wrist-joint that I have treated by this method. The success is apparently even better than it is in the ankle or knee-joints.

The trochar is inserted at a point opposite the styloid process of ulna or radius a little nearer the dorsal than the palmar surface. It is carried entirely through the joint to the opposite side of the wrist and withdrawn slowly while the injection is being made.

Usually not more than 2 or 4 drachms can be injected into this joint consequently we use a 20 per cent. emulsion in these cases.

TUBERCULOSIS OF SACRO-ILIAC JOINT.

Miss Mary G., Age 20, American, well nourished, healthy appearing young woman.

Since six years has had swelling in the region of the sacro-iliac joint. This opened and left a sinus in the gluteo-femoral fold three inches below the great trochanter. One year ago the patient had some trouble in the hip joint but this has entirely subsided, The joint is freely movable without giving rise to pain. The sinus extends in the direction of the sacro-iliac joint. it can be followed by means of a probe for a distance of five inches but no diseased bone can be discovered, although this undoubtedly exists.

The patient is so slightly inconvenienced that the radical steps necessary to ensure a permanent cure, viz:—laying open the sinus exposing and removing the diseased bone, do not seem warranted. We will advise her to return in case of further trouble or inconvenience.

In the mean time we will advise the use of good food, exercise in the open air and systematic treatment with tonics and malt and cod liver oil.

A patient who is suffering from a localized tuberculosis like the one before you which does not give rise to any inconvenience or pain and does not seem to affect the general condition usually recovers more rapidly and more perfectly without than with the use of operative treatment.

Tubercular Abscess Connected With Sternal End of Ribs.

S. B. R., Watertown, Iowa, Age 34, American, Railroad man.

You see a small swelling on the left side of this man's chest, a little below the nipple. He first noticed it two years ago. During the last two months it has increased a little in size and is a little more tender. It is soft to the touch, fluctuates, and is situated directly over the apex beat of the heart, yet it does not pulsate, consequently it is not connected with any large blood vessel. The tumor is situated in the position in which we not infrequently find what we term a "cold abscess" in connection with the ribs and costal cartilages. You understand that we mean a tubercular abscess the same as we find in other parts of the body. I will introduce the aspirator needle and see if I can get the characteristic fluid from it. I tell the patient that it is not an aneurism, or there would be pulsation in it; and if it were, the introduction of this small needle would do him no harm. This is, of course, the only way to arrive at an absolute diagnosis in this case. If it is a "cold abscess," the contents will be so thick that it will not pass through the small needle to any extent, and I shall be able to get no more than a drop or two of fluid, which I have succeeded in doing and which proves to be the thick, gelatinous, cheesy matter characteristic of the disease.

The patient, therefore, has a tubercular abscess in connection with the ribs or sternum.

In all such cases it is well not to make a positive diagnosis without the use of the aspirator.

We will make an incision down to the rib evacuating all of the tubercular pus. We find that the abscess cavity is lined throughout with a layer of soft velvety granulations. Just at the junction of the sixth rib with its cartilage we find an abraded point. The periosteum is destroyed and the bone to the depth of 1-16 inch is in a carious condition.

We will remove the diseased bone and then curette the cavity in the rib thoroughly.

The entire cavity will now be vigorously scrubbed in order to remove any loose particles which may remain after curetting. Then it will be dusted with iodoform and tightly packed with iodoform gauze. Secondary sutures will be introduced and left loose to be tied about the fifth day, after removing the gauze packing.

The wound will be entirely healed in three weeks if nothing unexpected occurs.

Tubercular Lymphatic Glands of the Neck.

Miss Lizzie M., Geneseo, Ill., Age 19, American.

There are certain absorbent vessels in the human organism known as lymphatics. They begin in the fine microscopal lymph-capillaries all over the body wherever blood vessels are found, collect themselves finally into two trunks and empty into the subclavian veins at the junction of the internal jugular veins. They have connected with them certain lymphatic glands which are arranged in a specified position. These absorbent vessels and glands are distributed in two sets, the superficial and the deep.

The superficial ones are subcutaneous and accompany the superficial veins of the body. The deep lymphatics are larger than the superficial, are fewer and are found accompanying the deep blood vessels.

We have a variety of diseases surgical in nature in connection with these glands of the lymphatic system. These diseases may be classified into the acute and the chronic. A very good example of an acute disease of the lymphatic system is found in bubo through the infection with gonococcus of the lymphatic glands of the groin. We have a manifestation of the same sort of trouble in different parts of the body from syphilitic infection. You remember that we have lymphatic vessels with their glands extending from below the chin around behind the angle of the jaw to the side of the neck. If a patient comes to you with an unhealthy, dirty looking ulcer, circular in form with a peculiar enlargement beneath the chin it is almost a positive diagnosis of a syphilitic trouble. And of course you may have enlargement of the lymphatic glands of any portion of the body from syphilitic infection, or from the introduction into the system of the pus microbes. The gland or glands, as the case may be, enlarge and break down in pus. These are examples of acute disease of the lymphatic system.

An example of chronic diseases of the lymphatic system is seen in the infection of the glands by the baccilli of tuberculosis.

In this case the growth of the gland is slow and insidious and does not show the early disposition to break down. In all of these cases of tubercular glands, whether the infection is circumscribed or is general in its character, you should seek the course through which the baccillus entered the gland. Hence it behooves you in all such cases to examine the mouth, throat, and nose to determine the abrasion through which the bacillus was allowed to enter.

Now, this patient before you is a case of this nature. She had a tubercular infection of one or not more than two lymphatic glands at the angle of the jaw. The patient had an operation for the removal of these diseased glands at this seat four months ago. You can readily see the scar resulting from that operation. She was relieved for a time, but the disease returned and you notice that the glands situated along the posterior border of the sterno-cleido-mastoid muscle are enlarged, as well as those at the original seat of the disease. As a rule, it is not worth while to operate in these cases of recurrence if many glands are involved. If only three or four of them are involved they may be removed, but if there are many, an operation will not remove them all and there will be a strong tendency for them to return. Sometimes they will not return for years, at other times it will only be months. I once heard a very famous surgeon say that he was sometimes induced to operate in these cases, sometimes quite extensively, because the removal of the larger glands was followed by the absorption of the contents of the smaller. I have never seen that result in any of my cases. In most there has been a return of the disease, notwithstanding the fact that a very extensive operation was done.

So far as these glands of the neck are concerned, if they are in the superficial fascia, and so long as they remain superficial there is but very little difficulty in their removal. Separating the tissues and coming down upon the capsule, you will observe the rule of keeping close to the tumor and by a process of emulction the mass may be easily removed. The glands are always softer in the secondary manifestation than primarily and break down much more readily. So that when you reach the glands you will find that they are very soft and the corresponding pressure which you may put on the glands of the primary disease in their removal would destroy them, making it very difficult to allow to follow them up and remove them. You will therefore keep as close to the gland as you can, but at the same time be careful not to break into the interior. Now, here is a gland which looks as if it were superficial, but I find, as we very frequently do, that, notwithstanding its superficial appearance, it extends deeply down into the tissues of the neck. Hence, I must use a good deal of care when I come to lift out its base so that I shall not commit the error which I have warned you against. I have advised you not to pull the gland up and divide its base when the tissue is on the stretch. Because if any vessels are running along the base they may be divided in such a way that they are very difficult to take up with haemostatic forceps and you would then have a hemorrhage that would be very difficult to control. When I remove this, you will see that its ramifications extend much deeper than its external appearance would suggest. And this must be remembered when you attempt to lift it from its base, for you can never tell from what tissues and structures it has grown.

It is always a very good idea to seize the base of the pedicle with a pair of forceps before you separate the tumor from its attachments.

This gland which I have now succeeded in removing is a very good illustration of this point. You notice how deeply it extended into the muscles of the neck and you can readily see that any pulling that would bring it up into the wound would very likely have injured the internal carotid or other important vessels.

Now, instead of dividing the muscular fibres to get at these remaining glands, we will go behind the sterno-cleido-mastoid muscle. It may be necessary to divide a few of the fibres. We will make the incision very free so that the wound will be large enough to permit of easy removal of the gland. I have made the incision very near a large vein. You can see the blue projecting mass. It will give you an idea of the characteristic appearance of the large veins well distended with blood. This is the deep jugular vein.

Making my incision behind the sterno-cleido-mastoid muscle, you notice that I do not make the incision through the skin and superficial fascia but also partially through the muscles as well down upon the deep glands of the region. I find that what I have told you is likely to be found in the recurrence of the disease is true here. This gland is very much softer than the original first diseased glands. Hence the removal will be attended with more difficulty than either the one just removed or those removed some months ago. It is well, when you get well down into the wound, to separate the tissues with the handle of the knife instead of the blade. Quite frequently you can do more with the scissors and forceps than with the knife. You are better able to get at the parts near the tumor than with the knife and they are safer to use. There has been so much inflammation in connection with the glands and the surrounding tissue that the former show no disposition to enucleate and it will be necessary for me to dissect it from the surrounding tissue. This will cause me to open some small vessels. I have opened one now which the assistant is a little anxious about so we will apply hæmostatic forceps to it. It is a very much more difficult operation when the gland is surrounded by this condensed tissue than when it is encapsulated. Of course, there is no particular danger so long as I am working about the posterior border of this gland for we know that the vessels of this neighborhood are not of much consequence and will not give so serious hemorrhage But when we get to the anterior part then I want to see just where every incision is made, and, hence as a rule I prefer to separate the gland from before backward getting it separated from the important vessels first. I have succeeded in getting out this large mass. We will pass them about and let you see the character of the soft glands due to the recurrence of the disease.

We are operating, as you see, very closely to the base of the neck. The blood vessels are enlarged and during this act of vomiting we might have air drawn into some of the vessels. Hence, during this vomiting spell we will pack the wound with iodoform gauze to prevent any accident. I have now found a gland so soft that the slightest pressure has ruptured it.

Of course there are a good many different methods of treatment for this disease. Perhaps the old-fashioned method of stimulating the external surface of the neck by lotions such as the compound tincture of iodine has been used. The idea, of course, being to stimulate the surface so as to lead to absorption of the substance of the gland tissue. I cannot say that they have acted in that way so far as the disease is concerned. This is a tubercular gland and no doubt the microscope will reveal the baccilli the same as it would in tubercular joints but not in the same number.

Not many years ago an operator in the army tried a local treatment for such cases. His idea was that he could cure all such infections by injecting into the parts ten or twenty drops of carbolic acid. The treatment seemed to do good in many cases and in many other instances it seemed to be quite useless.

Lately I have pursued the plan of injecting into the gland from five to twenty drops of a 1-1000 solution of the bichloride of mercury according to the size of the gland. In one case at least, there has been very marked improvement. The manifestations were very much more marked than in this case and one of the glands had entered into the process of suppuration and after the first injection broke down. The cavity rapidly closed and we kept on injecting one or all of the glands at once with the effect of a rapid disappearance of the glands until it is now very difficult to find them. Another fact in connection with the same patient is that his general health is much improved. His appetite, flesh and color are much improved. All this is in accordance with what we know about mercury. In small doses it is a tonic as well as an antiseptic. I am, therefore, inclined to treat these glands in this way. But this young lady had such an easy time with the other operation that she wishes to have these removed in the same way and we will accommodate her. If, however, there is an increase in the size of the glands after this operation we will treat them as we have many others by injecting them in the way I have suggested.

You must remember that everything must be done in these cases to improve the patient's general health. Give them plenty of good food, especially those rich in fats. Often you will inquire into their history to find that they avoid fats in their food. If this be the case, you must try to lead them back to the proper path and induce them to eat fats. Milk, cream and codliver oil should be freely used. In this way you can do much toward staying the progress of the disease if not interrupting it entirely. Usually the disease is slow and we class it among the chronic diseases of the lymphatic system. We have another disease which would come under the head of acute disorder if we classify them according to the rapidity of the growth and that is sarcoma affecting the lymph glands of the body. It is often found in the exillary space and less frequently in the femoral region. We had an example, in the hospital of a girl with sarcomatous lymphatic glands on either side of the neck and also in the axilla. The growth of the glands was so rapid that both sides of the neck extended out three inches beyond the normal. So rapid was the progress of the disease that within four months she actually choked to death from its effects. We have no treatment that I know of that will stop its progress in such cases. Sometimes the disposition is toward a few glands only. As in an old lady under our charge. She had two or three glands diseased, one of which had undergone colloid degeneration. Such cases are favorable for operation. Since the operation she has gone rapidly to recovery from the disease. As a rule it is a disease over which the surgeon has very little control.

You should never forget the danger which exists in operating at the base of the neck beneath the superficial veins of opening the jugular or subclavian veins and allowing air to enter. Consequently the veins should be compressed between the seat of the operation and the heart. The heart acts as a suction pump and unless you use every precaution to prevent it, there is much danger of air being sucked into it, resulting in death. The farther you go from the base of the neck the less is the danger. But the same danger is present in the axillary space.

I show you a specimen of 75 glands which I removed from a boy's neck. They filled up the entire space between the clavicle and the neck. I show them to you for it is the only case in which there has been no tendency toward a return of the disease.

It was a very extensive operation and perhaps we were able to remove all of the glands. This is much easier to accomplish in children than in adults and it is much easier in the first operation than in the second.

TUBERCULOSIS OF EPIDIDYMIS.

J. W., Chicago, Age 30, Scotchman, Machinist, generally healthy, well nourished.

On examination we find that this man has a hard nodular mass occupying the position of the left epididymis. This existed for several months. It gives rise to but little pain and advances very slowly in an upward direction. Cases of this character and presenting this special feeling have in my experience proven to be tubercular. Based upon that belief this affection, however slight and simple it may seem to be, is of serious import to the patient. While it is present it is a constant source of danger from possible general tubercular infection. The only reasonable treatment to advise or pursue is total extirpation of the diseased organ. The patient does not consent to any such interference, and I do not expect him to, still I am quite well convinced that it is the safest procedure to adopt in this case, and it is my duty to warn him of the risks he runs with this center of disease in his system.

As he will not consent to the operation suggested, we will prescribe such medicines for internal use as are supposed to have a beneficial influence on this disease. We will also direct the daily inunction of the diseased part with a small amount of mercury ointment.

TUBERCULOSIS OF THE SKIN.

James B. F., Age 34, Laborer.

This young man says that the pathological condition which you see on the left side of his chin, about the size of a dollar, first appeared as a small pimple, and became quite noticeable in the course of a week. It appeared eight months ago and since then has shown a disposition to extend. It has changed its appearance several times. A month ago it projected over the surface and had light colored enlargements somewhat resembling warts in the center.

The patient has let his beard grow over the growth in order to hide it. When he applies caustics it becomes irritated and painful. It is a case of lupus having the characteristic granular appearance advancing upon the surrounding tissues from its margin and leaving a white scar after healing. It is perhaps a little rapid in its development but that is explained on the ground of stimulation of caustics. This would be a most excellent case on which to try injections of Koch's lymph. If we had some of his lymph we would try it on this gentleman, for the purpose of cure as well as of diagnosis. If it is a case of lupus there would be the usual reaction which follows the injection of lymph. There would follow also the effect, the destruction of tissues in which the bacillus is contained, as is reported by all who have tried it in this country and in Europe. There is no doubt it has a peculiar effect upon lupus at least, and no doubt upon tuberculosis in other parts of the body. But it is more evident in lupus because the effect can be seen, this being external. We will refer the patient to Prof. Hyde, and see if he confirms the diagnosis. I have no doubt he will institute a process of treatment that will relieve the patient. Many surgeons have tried to curette the surface, destroying all the tissue which is the seat of the disease. But it is said the best results have followed the use of the curette with subsequent cauterizations, scraping out everything down to healthy tissue then carefully applying the Paqueline cautery and then treating the surface as an ordinary ulcer. Of course we all hope the discovery of Prof. Koch will prove a cure for such cases.

Tuberculosis of the Mamma.

Mrs. Mary H., 58 Park Ave., Age 30, American, seamstress.

This patient whose general appearance is anæmic, has a swelling in the left breast, which has increased in size very slowly, has given rise to but little pain and no symptoms of inflammation except that the patient's temperature is slightly elevated in the evening. The integment is movable over the swelling and the latter is movable over the deeper tissues.

Fluctuation cannot be definitely demonstrated but the patient's general appearance and the history of tuberculosis in the family, together with the conditions present warrant the diagnosis of a tubercular abscess. In cases in which there is any doubt you should resort to the aid of the hypodermic needle.

Mistakes of diagnosis have been made by almost every prominent surgeon in similar cases and I think it worth while to call your attention to the fact.

We will lay this abscess open freely. It contains the characteristic liquid, granular tubercular pus. The walls of the abscess cavity are thick and covered by soft tubercular granulations. After thoroughly curetting and irrigating the cavity, we will dust it with iodoform and pack it with iodoform gauze and permit it to heal from the bottom by granulation.

Ganglion on Extensor Tendons of Hand.

Mr. J., 575 Blue Island Ave., Age 20, U. S., Druggist.

This man comes with a small tumor on the dorsum of the wrist. When the hand is extended the growth is not seen, but when I flex it you see it is made very prominent. It is similar to the one you saw us remove from the hand of a woman a few days ago. It is a sac in connection with the sheaths of the tendons lying beneath it and it is filled with synovial fluid. It is termed a ganglion and usually follows a strain of some kind. Piano players and persons who make rapid movements of these tendons not infrequently have them. They are also not infrequently found in connection with tuberculosis. You remember a few days ago I opened one of these ganglions on the back of the hand of a young lady, and found a large number of "rice bodies." These "rice bodies" have been introduced into the bodies of lower animals, especially guinea pigs and rabbits and have caused tuberculosis in them which proves their connection with that disease. Sometimes the sac of the ganglion is very thin and a blow or pressure will rupture it and distribute the fluid equally over the posterior surface of the hand where it is absorbed. At other times, as in this case, it is necessary to introduce the tenotomy knife subcutaneously in several places and locate the fluid in that way. You now see the tenacious, gelatinous, transparent fluid escaping through the opening made with the knife. The emptying of the sac is not sufficient to lead to a cure. The sac will refill unless its surfaces are pressed in contact with each other and held together. This can be best done by making a small pad from a narrow sheet of gauze just large enough to well cover the sac. A thin preparation of plaster of Paris of the consistency of cream can then be molded to the back of the hand and fitted to every elevation and depression perfectly, thus making equal pressure on all parts. This treatment frequently leads to a permanent cure.

Since the discovery of tubercle bacilli in these specimens we have advised removal of the entire swelling by dissection, thorough disinfection and closure of the wound. If a patient will consent to such radical treatment, it should be practiced provided the surgeon employs perfect methods of aseptic or antiseptic surgery. If infection takes place it is not confined to the sac, but spreads into the connective tissue of the synovial membrane of the tendon up and down, so that it produces an inflammation that destroys the usefulness of the hand entirely.

CARCINOMA OF THE BREAST.

Case I.

This patient is fifty-five years old and has had a growth in connection with the right breast for three years. At that time she discovered it as a small lump in the lower outer portion of the gland, which had previously given rise to no trouble. There was no pain and no tenderness, but, when first discovered, she noticed the character of extreme hardness belonging to the abnormal body. Now she comes to us with this tumor, which moves freely with the breast in the subjacent tissues as the position of that organ is changed. The skin can be moved over the surface of the tumor only around the circumference of the gland, being fixed and immovable over the greater portion of its central part. The tumor is about six times as large as when first discovered, and now approaches the size of an orange. Until one year ago, there was no discoloration of the skin; now there is plainly visible a dark-red color over the tumor itself, being darkest immediately about the nipple and its areola.

There is also a noticeable peculiarity present, in that for some distance around this brawny area there is to be seen a very marked dimpling. This corrugation of the skin and the retraction of the nipple which is present are due to the fact that the growth, by its inherent power of contraction, draws upon and shortens the galactiferous tubes and the vertical bands of fibrous tissue which connect the skin with the deeper tissues. The retraction of the nipple is not so marked as in many of these cases, because the growth surrounds rather than implicates the lacteal tubes; but the tumor shows plainly its remarkable effect on the skin covering it. This contraction and its effect upon the nipple and skin should be remembered and appreciated when seen, as its presence is a sure indication of the malignant character of a tumor, no matter how slight its manifestation.

This is a tumor of rather slow growth, but shows the disposition to infiltrate and take into itself all the surrounding tissues. It is also likely to ulcerate, as indicated by this blueness of surface, marking the commencement of interference with the circulation of the skin which will finally lead to its degeneration and destruction.

It is evidently a malignant tumor which requires removal, and we will proceed to excise the entire mamma, as it would be useless to remove the tumor itself.

The incisions made in performing the operation should divide tissues widely removed from tne gland itself or any local manifestation of the disease in the shape of hardness in the surrounding tissues. There should be no hesitation in sacrificing any amount of tissue when suspicious in character, if one expects by an operation to prevent return of the disease. No regular rules can be given or followed for the directions of the necessary incisions. They must be made so as to go wide of all manifestations of infiltration or invasion into the surrounding tissues. Neither should the question of the time expended in the operation be an item of consideration. Aim always to do the necessary work well and thoroughly.

The lower incision is usually best made first. The knife is carried rapidly through everything down to the muscular investment of the chest wall. The lower border of the gland being uncovered, the entire mamma is dissected from the surface of the pectoralis major muscle. My plan is to remove the fascia covering this muscle, freely exposing the muscle-fibre until the mass is held by the skin-covering at its upper border, which is finally divided. The procedures thus far illustrate this method perfectly. The fascia of the muscle is removed with the tumor, because experience has shown that a manifestation of the return of the growth is extremely apt to occur in this tissue if it is not removed. Bleeding vessels are caught by forceps as soon as divided, so that comparitively little blood is lost even after very extensive excisions.

Now, I carefully examine every portion of the fresh surface to ascertain whether any hardened tissue has escaped removal; if any is found, it is unhesitatingly and widely removed, even if it becomes necessary to sacrifice the muscles of the chest.

It is seldom that a malignant tumor of the breast is unaccompanied by infiltration of the lymphatic glands of the axilla in some degree, perhaps unrecognizable from external examination, but still certainly present. Hence, it is necessary to open the axillary space by prolonging the incision across it just below its anterior border, divide carefully the superficial and deep fascia forming its floor, and uncover it at once. The axillary vein as a guide to the situation of the vessels and nerves on the outer wall of the axilla. Here, as elsewhere during any operation, first uncover the point from which most danger is anticipated. When the vein is uncovered and held out of the way, all other important structures go with it, and the axilla can then be easily cleared of the enlarged glands embedded in loose fat. This should be done thoroughly in all directions, leaving nothing behind that shows any evidence of disease.

You remember that in this case I could feel no enlarged glands before the space was opened, and now you see that I uncover several concealed by the pectoral muscle and beneath the clavicle. The space between the pectoralis major and minor muscles is especially liable to contain infected lymph glands.

In removing a malignant tumor always avoid cutting into the growth. Also avoid pressure upon it, for I am satisfied that harsh manipulation often leads to direct infection, followed by rapid return of the disease.

By care all the loose tissue in the axilla is cleared out and with it such glands as may be contained in it. Here, you perceive the search has been rewarded by obtaining quite a number of all sizes, although none were found by careful external examination.

It is needless to say that many glands, enlarged sufficiently to be an evidence of the extension of the malignant process, cannot be found without this exploration and the operation is not complete without the removal of all the fat contained in the axilla. This mass of dense fat in the region of the wound is a source of danger, and hence it is dissected out.

The borders of the axillary space should be examined carefully, because enlarged glands are apt to be found in this region.

In order to provide for drainage through this lower portion of the wound, I shall thrust a pair of scissors or a knife through the tissues at the most dependent part. This will be the direction in which the drain will naturally flow, as the patient will be on her back most of the time during the process of repair.

Having removed all evidences of the disease, the wound is closed by approximating its edges with the continuous catgut suture applied in two rows. The first row of stitches is introduced some distance away from the edges of the wound and rather far apart, to act as stay sutures; and the second row, for close approximation, is introduced in the intervals between the first.

A large external dressing of iodoform-gauze and borated cotton is applied, and held in place by a body bandage. This dressing is left in place for a week or ten days, unless the patient shows a rise of temperature. All going well, when the dressing is removed, the wound will be found entirely healed, as you have seen many times in cases shown you.

In some cases we have a little flow of serum, but not so much as we had a year ago when we used antiseptic solutions. You know that we now use no washes or solutions of any kind, hence we do not irritate the surface of the wound and consequently have less discharge. The vessels are all secured and there is no bleeding from the veins, and there is no reason why the dressing should be removed for a week or ten days. Changing the dressings much less frequently than formerly, makes less work for the surgeon and is much better for the patient. If, after the first dressing is removed, the wound be not absolutely dry and perfectly healed, but shows signs of redness along its edges, we shall apply for a few days a wet antiseptic dressing made of a few folds of sterilized gauze saturated with a three per cent. solution of carbolic acid and covered with some impervious substance, such as oiled silk or rubber tissue. This same cloth dressing is to be used for the relief of inflammation in the wound earlier in its course, provided infection has inflamed its edges and necessitated earlier disturbance of the dressings.

It is well to prevent motion by bandaging the arm to the body, but let me impress upon your minds the uselessness and cruelty of insisting on your patients being absolutely still. They will obey your requests and will lie still for hours. Try lying in one position for an hour, and you will soon become impressed with the disagreeable feeling, no matter how comfortable was the position at the beginning it soon becomes an actual torture. A slight movement of half an inch will rest the patient materially. I have sometimes found that patients have kept still for 24 hours, and a slight movement relieved them of the consequent suffering almost instantly.

Now, let me examine the tumor itself. As you see, the discoloration is not entirely lost, even after the flow of blood has stopped. You must not notice the hardness, which is characteristic of this variety of malignant tumors, and from which the name of schirrhus is obtained, stone-like. It constitutes a pathognomonic sign. You will notice the little depressions which show the fixation of the tumor in the investing skin, also the freedom of movement of the breast on the deep tissue and beneath the skin. The degree of mobility of the tumor on the chest walls is always a sign for which you look in case you advise an operation. If the mass is immovably fixed to the chest walls, an operation will do no good whatever and should be discouraged.

In order that you may not be deprived of examining the characteristics to be noted in the tumor itself, I will open this specimen in such a way as not to destroy them before passing them up to you. You will notice the juice which flows out of the incision upon pressure; it is milky in color. Notice also that, instead of the cut surfaces bulging and being convex, they are concave. There is one point always to remember, the extreme hardness of the mass always present in this variety of malignant tumors of the breast. It is remarkably evident in this specimen.

FIBRO-CYSTIC TUMOR OF BREAST.

Case II.—M.

Mrs. Jas. S. Casapolis, Mich., Age 37, American, housewife.

The patient before you is the one who was here a few days ago with the large tumor on the breast. It is the largest tumor that I have had the opportunity of seeing. It is an innocent tumor in every way, growing as a knot grows on a tree, between the trabeculæ of the gland. It is an illustration of a large cystic tumor of the gland. We know that it is not malignant from its history, it having been in progress of growth for ten or more years. There has been no increase in the size of the lymphatic glands. There has been no disposition toward the discoloration and infiltration of the skin over the tumor. I have never seen but one other case like this and I think in that case the tumor was nearly as large as this. It came under my observation some two years ago. It was a wonder to me how this lady carried the tumor around and concealed it. While I was talking with her I was surprised that I could not see where it was. I finally discovered her plan of concealing its presence; it was by carrying it under her arm. This had stretched the skin, forming a pedicle, in this position and she was able to carry it and hide it from view. Of course, these veins are very large and having no valves they give rise to a good deal of bleeding and will give a spurt of blood as large as the radical or ulnara arteries.

Not infrequently you will find that a growth like this which is an outgrowth from the gland, does not implicate the entire gland but is from some portion and spreads over the healthy part without implicating it. You can see the fluid running out of the tumor as I cut it, showing that it is composed of cysts closely applied, the same as multilocular cysts anywhere. You remember that I called your attention to the manner in which the skin was drawn by the tumor, and by its being carried under the arm. Now that the tumor is removed, you see the skin has drawn up on it so that I have left comparatively a small portion of the sk compared with the size of the tumor. The edges of the skin fall apart and this illustrates its elasticity. This elasticity of the skin is a feature that must be remembered in the removal of tumors, especially in portions of the body in which the skin is loose; unless care is exercised you will remove more skin than you can cover. These vessels are tied with silk ligatures. We have found that silk is as harmless as catgut if the wound is not infected. The edges of the wound are approximated by means of the silk sutures. In sewing a superficial wound do not take a stitch too deep or the edges of the wound will turn inward and will not unite. The stitch should not be more than ¼ inch in depth unless you have a deep wound in which you use deep tension and superficial coaptation sutures. I see that my assistant is going to use the interrupted suture. You know that it has an advantage over the continued suture in that, if a suture breaks the other stitches will hold the wound, whereas, if the thread of the continuous suture breaks the entire suture is loosened. The continuous suture is the easiest applied and acts very well in many cases in which you do not expect to have much tension. Here, as well as in the interrupted suture, it is wise to put in deep stay stitches, and especially in wounds about the breast. This is a case in which you follow the rule of keeping near the tumor in its removal. In malignant tumors you keep away from the tumor cutting through the healthy tissue, removing every portion of the diseased tissue. With the wound in this position the skin can be drawn down from the shoulder or up from the abdomen and held in place by deep stay or quilled suture while the edges of the skin are approximated by the interrupted sutures. Then deep stitches will be left in for a week or ten days until the edges have adhered.

There seems to be a little oozing, so we will introduce a small drainage tube.

Fibro Adenoma of Breast.

Case III.

When speaking to you about tumors of the breast, I called your attention to fibromata and told you that they are apt to make their appearance in the mammæ about the time of puberty. Their position is usually to one or the other side rather than in the center, as you see is the case here. This tumor is situated a little to the inner side of the middle line of the mamma, and just below the left nipple. It is freely movable under the skin, and does not implicate the tissues of the gland sufficiently to necessitate the removal of the gland. The skin is freely movable over it and the growth has all of the characteristics of a fibroma or of a fibro-adenoma. You notice that the nipple is not implicated in the growth. It is not inverted or retracted as is so often the case in tumors of the mammæ malignant in character. Palpation detects a peculiar firmness; not the so-called "stony hardness" of the schirrhus variety, but it is firmer than the normal glandular tissue. Usually, you will have no difficulty in diagnosing these cases, and you will be able to remove them through an incision directly over their most prominent point without difficulty. Not infrequently they can be turned out of the incision without doing much damage to the glandular tissue; I think I will be able to do so here. This tumor, you see, had a capsule of its own composed of connective tissue, and I have succeeded in removing it without doing any injury to the glandular tissue. As it is passed about, you will see that it is principally made up of glandular tissue, hence it is an adenoma. At its base you will see quite an amount of fibrous tissue, hence it is a fibro-adenoma.

Of course, your patients with tumors of the breast will be very anxious about the character of the growth and the prognosis, because malignant tumors are so frequently found in this situation. Families are very much concerned when the slightest tumor manifests itself, and you must be able to tell them that a tumor of this character, freely movable in all directions under the skin and on the deeper tissues, in a woman of this age is not a malignant growth. You can say positively that if it is removed, it will be followed by a prompt and permanent recovery.

This is a patient from whose breast we removed the fibro-adenoma ten days ago. The wound has healed perfectly, you see, and you would not know from the appearance of the patient and the breast that any operation had been done. This is the first time that the dressings have been disturbed since the operation The patient has shown us no constitutional disturbance whatever and she should not. If her condition had not been aseptic from the first, and throughout the course of healing, it would have been evident that some one had infected the wound, during the operation.

CARCINOMA OF STOMACH.

This patient complains of some difficulty in the abdomen, the nature of which we are not at all positive about after examination. There is to be found over the abdominal surface, especially in the upper portion, a mass with a sort of irregular surface to the touch, nodulated, as we call it, in the course of the transverse colon. Also upon the left side in the neighborhood of the cardiac extremity of the stomach an enlargement that can be followed across the abdomen in the epigastric region, so that we are enabled to determine his difficulty. The symptoms rather indicate it to be of a malignant nature. It concerns some portion of the alimentary track. There is interference with the patient's nutrition. We have concluded to make an exploratory laparotomy. Nothing can be promised the patient, except that the operation will determine whether relief can be given. No benefit has been obtained by the use of medicine, and so we will try this means to determine whether any surgical interference will bring relief. There is a condition here which is not present usually in the abdomen the veins running from the lower portion upwards are in a varicose condition, calling attention to the probable presence of some obstructive disease in the abdominal cavity. We have a superabundance of peritoneal fluid, which of course flows out as soon as the abdomen is opened. I find we have a malignant growth in the stomach extending over its left side. By turning the stomach up and pulling it a little towards the right side I uncover the infected portions of the stomach walls, the infiltration extending across the anterior surface. Here we have the edge of the omentum containing quite a number of nodules. Turning up the stomach I immediately bring into view a portion of the intestine which I know to be the transverse colon, on account of its lobular shape in that it has a distinct wide band of fibres running longitudinally. As I turn the stomach upwards and tear through this omentum I can get into perfectly healthy stomach, soft and uninfiltrated, whereas the upper surface is hard and dense from infiltration. There is no well marked evidence of obstruction of the pylorus. The passage of food from the stomach into the small intestines is not interrupted, hence I question whether very much would be gained by doing in this case a gastro-enterostomy. This man has an absolutely incurable disease and so extensive that I cannot remove it, without removing two thirds of the wall of the stomach. But it is rather surprising that in many of these cases the patient is relieved by the operation notwithstanding the fact that nothing is done beyond an exploratory incision. The testimony is so clear and positive upon this point, from so many sources, that we must believe whatever unexpected relief follows the attempt has been due to nothing more than opening the abdominal walls and manipulating the contents of the abdomen. We do not known whether any such effect will be produced in this case. He will certainly be relieved by the loss of the peritoneal fluid and the distention caused by its presence, and for the time being he will be benefitted. These beneficial results do not follow simple tapping. This is particularly true in the cases of tubercular peritonitis. You can tap those cases as often as you desire with only temporary relief, but when a laparotomy is done many of these cases pass on, to permanent recovery. There is no reformation of the accumulated fluid and the evidence of disease in the shape of nodules disappears. We cannot expect any such effect from this operation. In this location carcinoma is an incurable disease. It is always, as in the days of Velpeau a disease that never surrenders, that never gives sympathy at all to its victim, but always kills. Hence, this operation will possibly give this patient the relief mentioned, but it will not cure the disease. If I had found the disease moderate in extent and confined to the stomach even had there been no complete obstruction to the passage from the stomach to the bowels, I should have made the operation of gastro-enterestomy the junction of the small intestines and the stomach. It is comparatively a simple operation and one which can be done quite rapidly. It is not necessary to have any special material or apparatus to perform it. It is practically nothing but a vestibule formed between these two portions of the alimentary canal. Of course you are well aware of the great advance that has been made in all operations for the relief of disease in the abdominal cavity, and the surgeon is tempted to do many operations that in fact confer no benefit upon the patient; they merely prove the fact that when you unite portions of the intestinal tube and make an opening between them the course of the contents will follow the opening. That was proved many years ago, and if we resect large portions of the tube the ends may be brought together and a continuity restablished. But that does not remove the disease. In hundreds of cases that have been done there are few indeed in which the recovery has extended over a period of three years. We will close the abdominal cavity in the usual manner, it will heal in as short a time as in cases not complicated with malignant growths.

Carcinoma of the Tongue and Mouth.

John W., Scandia, Wis., Age 40; U. S., Farmer.

This case is a very unfortunate one and I do not expect that its treatment will be followed by a great amount of satisfaction,

However the patient is in such a sad condition that he is not able to eat and is in constant misery, so that I shall do what I can to relieve him by removing the entire chin, the floor of the mouth, a portion of the superior maxillary bone and a portion of the tongue. We shall leave a portion of the tongue, for the laity believe that if a portion of the tongue is left the patient can talk better than if the entire organ is removed. We have seen cases which disprove this, however, in persons who have had the tongue removed at the base. Such persons talk with a remarkable degree of clearness after a sufficient time has elapsed in which to train the organs of speech. In order to control the hemorrhage from the tongue we will transfix it near its base with a needle armed with heavy double silk ligature and tie in halves. The diseased portion is now removed freely and the margin of the tongue is closed by means of interrupted sutures this will control the hemorrhage permanently so that the temporary ligature can be removed. Remember, when doing an operation about the tongue which severs the anterior attachments of the genio-hyoglossus and the genio-hyoid muscles, that you have also destroyed the anterior attachment of the tongue. There is, therefore, nothing to prevent the tongue from falling back into the pharynx, closing the glottis and choking the patient. It is very necessary then for you to secure the tongue by passing a ligature through it so that you are thus enabled to hold it forward. The mylohyoid artery is enlarged and bleeds very freely. We will now remove the side of the face, including the upper and lower jaws, as rapidly as possible, following the methods we employed in the cases operated upon a few weeks ago. Very frequently you can stop hemorrhage from an artery which runs through the bone by seizing the bone in this manner with the lion jaw forceps and compressing the bony canal. There has been so much tissue removed that it is very difficult to say how much of a mouth we shall be able to get. The tissue which remains will be utilized to the best advantage remembering that the tissues of the face unite very kindly on account of their great vascularity.

We have succeeded in getting very good proportions now, as you can see. The anterior jugular vein bleeds every time the patient breathes, so we will ligate it. Now, until he gets control of his tongue, we shall have to fasten it outside. This is, I think, all that I shall close the mouth to-day, leaving him a good sized mouth. We should have been able to make a much more cosmetic appearance of the mouth had we been able to leave a portion of the chin.

You can see that the patient has a very fair color now, and is in a very fair condition. Having operated rapidly the patient will not suffer from shock.

CARCINOMA OF TONGUE.

Case I.—Thomas D.

We nearly had a death from the anæsthetic in this patient before bringing him before you. The air passages are very much obstructed by the disease in his mouth. The man has been here before, and we then delayed operating to determine, if possible, whether his trouble is specific or a malignant disease. We have examined it under the microscope and there is no doubt of its being of a malignant nature. The growth is under the tongue, filling the entire floor of the mouth and gums and affecting the bones of the lower jaw; it has destroyed a part of the tongue's attachment. Consequently the tongue dropped back into the pharynx as soon as he became partially anæsthetized. The man's face was cyanosed and he had stopped breathing. We opened the mouth and removed the mucus and finally grasped the tongue with a pair of vulsellum forceps and pulled it forcibly forward.

The head was also placed low and then by resorting to artificial respiration, we revived the patient. This is a very bad case and will take a good deal of time. I am encouraged in this case, notwithstanding its unfavorable nature because to-day I have received word that a patient on whom we operated ten mouths ago for cancer of the face and from whom we removed a large portion of the face, replacing the removed portion by a flap from the neck, has entirely recovered from the operation and there is as yet no evidence of return. Now this man will die very soon if something is not done for him. The lymphatic glands are much enlarged. We shall tie the lingual arteries before attacking the disease in the mouth and in that way stop the bleeding from the tongue, although it will not have much effect on that coming from the floor of the mouth. Even here in the line of incision there is considerable hemorrhage for the lingual artery supplies only a portion of the blood which the tongue receives. It is my aim to find the upper extremity of the hyoid bone, and finding that, I shall have the guide for the hyo-glossus muscle. The artery will be in all probability just behind it on the upper border of the bone. Of course, this is all obscured by the infiltration and increases the difficulty of the operation in every way. Here I pick out one of the little lymphatic glands which obscures every thing. It is not the simplest thing to do an operation of this kind with everything clear, but when you have the entire field obscured the difficulty is greatly increased Both lingual arteries are tied in the usual way, close to the posterior border of the hyo-glossus muscle and the wounds temporarily packed with gauze. Now in order to get to the diseased tissues in all parts I will divide the lower jaw through the symphysis mentis with the metacarpal saw, completing the operation with the bone cutting forceps. Now that it is divided and some fibres of the mylo-hyoid muscle severed, you see the two halves fall widely apart giving a good view and way of reaching all disease. First I will fix the tongue close to the hyoid bone with a strong silk ligature passed entirely through its substance. This enables me to control the stump entirely after the tongue is removed so that 1 can catch easily any bleeding vessels, provided they have not been secured by the ligatures already placed, and serves a useful purpose in enabling us to prevent suffocation after the operation. This stay ligature in the tongue should always be used after division of the anterior attachments of the tongue in operations. The tongue is now cut away and also all loose and diseased tissues in the mouth. All that I cannot reach with the scissors I will now destroy with the actual cautery. Having finished all this, the ends of the separated bone are perforated with the drill, and a silver wire drawn through the openings thus made. This enables us to bring the separated jaw fairly and closely together again. The external incisions are now properly closed with interrupted sutures and dry antiseptic dressings applied. The stay suture through the remnant of the tongue is brought out of the mouth and fastened to the outside of the dressing.

The chief danger to the patient after this operation comes from shock and from the tendency to acquire a pneumonia form inspiring the discharges from the wound in the mouth. The shock is limited greatly by a rapid operation and by placing the patient in a thoroughly warmed bed after the operation. The latter danger is disposed of by elevating the foot of the bed 12 to 18 inches and making a depression in the mattress for the head so that the larynx will be higher than the mouth.

Packing the wound in the mouth thoroughly with iodoform gauze also aids very materially in decreasing the likelihood of the occurrence of an inspiration pneumonia.

CARCINOMA OF LOWER JAW.

J. W. M., Canton, Ill., Age 49, American, Cigar-maker.

This man has a tumor of the lower jaw, a malignant growth extending down upon the neck. We will be compelled to remove half of the lower jaw, together with the submixillary and sublingual glands and all infiltrated tissue. The jaw is partially exposed by the incision along the lower border of its body. A tooth is extracted and the jaw is divided with the chain-saw close to the symphysis and just in front of the angle. In this way the main mass is removed. A straight incision down the neck allows us safely to remove the neck infected glands. The incision closed with interrupted sutures.

You see there is a small opening here which has been cauterized and will soon be healed. Exposed in the wound is the hyoid bone, the hypoglossal nerve and the side of the tongue with its attachment to the lower jaw. When you have to do an operation involving the muscles of the tongue you must fix the tongue by running a thread through it to retain it, for sometimes it falls back into the mouth and chokes the patient.

We made a curved incision beneath the body of the jaw, that, when it heals the scar will be on the under side of the jaw. The man has a luxuriant growth of beard and will cover it.

The prognosis in this case is unfavorable on account of the extension of the disease into the lymphatic glands. The wounds which we have made will heal by first intention but we can be quite positive of a recurrence, consequently our efforts will result only in temporary relief.

EPITHELIOMA OF THE EYE-LID.

E. D., Hillsborough, Wis., age 55, American, farmer.

Here is a case of epithelioma of the upper eye-lid and eyebrow. The disease first made its appearance about 16 years ago. The progress has been delayed by the application of escharotics. He says that he would be inclined to have nothing done for it if it were not for the fact that it troubles his eye.

There is but one thing to do for it, and that is to remove it widely with the knife, going into healthy tissues in all directions, and perhaps taking off a scale of bone covering the frontal simus. That would be quite an extensive operation, but not a formidable one. I should make no attempt at closing the wound with stitches, but would either transplant at once by Thiersch's method, or, what I think better, after removing the disease deeply, to touch it at all points with the actual cautery and transplant later on.

It is a popular idea that escharotics are always more beneficial than the knife.

If a wound, as large as the one we are compelled to make in this case, were left to heal by granulation, a marked and very troublesome extropion of the upper eyelid would be sure to follow as a result of cicatricial contraction, but this is avoided by the use of Thiersch's skin transplantation.

EPITHELIOMA OF LOWER LIP.

W. B., Dayton, O., aged 66, American, nurseryman, family history good.

Thirteen years ago this patient had a growth in connection with the lower lip. A year ago it was removed, as he thought, by the application of an escharotic plaster or salve. Three or four months after this application the tumor began to grow, and has continued in its development until it has reached the size which you now see. I think we could not have a better illustration than this of the harmful effects of escharotics in such cases. There is no doubt that you can remove superficial malignant growths by such escharotics as the Vienna Paste. But in order to do this it must be used very freely. If only the superficial portion is removed, the tumor is stimulated into more active growth, as it has been in this case, leaving the patient greatly deformed. The lower lip has been entirely destroyed, and a large portion of the cheek and the tissues of the lower jaw are infiltrated. A large tumor has also formed inside the mouth. We shall therefore be obliged to remove a large portion of the face, and then the likelihood of a cure will not be nearly so great as it would have been had we removed the growth at first with the knife. I am satisfied that the best treatment for these malignant growths is the early use of the knife, going wide of the disease.

Usually the lip and cheek are so movable that you can remove large portions of them and then be able to unite the parts. Being so vascular the union takes place without any difficulty. All ulcers about the mouth are very apt to be foul, especially those which are malignant; and this case is not an exception. I will now tie these vessels before making further incisions, in order to get the forceps out of the way. You can not help being a little cruel in these cases, as it is impossible to keep the patient perfectly asleep during all stages of the operation.

The mouth is a little one-sided, but the important part of it is that it is large enough. I have no doubt that it will pull around in a few weeks without any difficulty, for we have a sufficient amount of tissue. If you were close enough you would see that I stopped the incision just short of the jugular vein. Had the diseased tissues made it necessary, I should have divided the vein.

Carcinoma of the Uterus.

This woman complains of pain in the inguinal region and of leucorrhœa. This is all that we get from her, and it is as much of a history as you will often get from your patients. Making a digital examination I find the cervix wide open, its edges forming a rough surface, with lacerations extending back on its sides. It is friable and is nothing but a broken down mass. A bad odor comes from it. It is an epithelioma of the cervix. There is too much infiltration of the surrounding structures to justify the radical operation consisting in the removal of the entire organ. We will advise the patient to come back and we will remove the trouble as completely as possible with the cautery. It will check the disease, give her comfort, and will not put her life in danger. In performing this operation we will be careful to destroy the tissues for a distance of half an inch beyond the visible margin of the disease in every direction in which the anatomical structures will permit this.

We will destroy the entire lining of the uterus, leaving this organ in the form of a thin shell.

The cavity will be packed with iodoform gauze, which will be left in place for two weeks; after its removal the patient will receive two or three warm douches daily until the wound is entirely healed.

EPITHELIOMA.

Here we have a very good example of epithelioma of the clitoris and principal part ot the labia minora, not implicating the urethra, I think, as yet. The patient tells me that there is some involvment of the cervix, which I doubt very much. At least there is no manifestation of it, except the little discharge that comes from the parts. She is in that condition now in which she has very irregular menstruation, and is about the time of life when it ceases, so that she does not know when it will manifest itself. I find the cervix perfectly smooth. Epithelioma in this situation, in my experience, does better than in any other portion of the body, except the lower lip. I have had some cases in which I have been compelled to remove the entire vulva some of the clitoris and part of the vestibule. In all these cases radical removals were performed, and the earliest manifestation of the return in any case was after three years; and some of them have had no return in an interval of seven years. That is very good history and we feel justified in advising radical removal in this case.

P. H., Plainville, Wis., Age 33, American, farmer, previous family history good.

This patient has some trouble on the left side of the penis. On examination I find a hard body about the size of an old-fashioned three-cent piece, situated under the skin and connected with the corpus cavernosum. It feels exactly like cartilage. I have met another case similar to this. The other one I saw two years ago on a patient having fully an inch of the organ affected; the mass extending beyond the mid line. I removed the growth and the parts repaired without any difficulty. It would be very interesting if this hard body should prove to be cartilage, because the organ in some of the lower animals is supported by cartilage. I think that I shall be able to make the incision in such a way as to avoid the large vessels of the organ. Of course this hardening of the tissues of one side of the organ will have the effect of changing its position under certain circumstances. I think the removal of the growth will largely obviate that trouble.

Some portions of this mass are almost as hard as bone. It has developed in the connective tissue of the corpus cavernosum, but the erectile tissue is not disturbed.

Not infrequently surgeons in operating on the penis are obliged to open into the erectile tissue, and when this is the case, it is very difficult to control the hemorrhage. This is especially true in such operations as the amputation of the organ in some malignant troubles. The hemorrhage in such cases may be stopped by applying the actual cautery to the stump. The heat should only be that of a "cherry red." If you do not succeed in stopping the hemorrhage in this way, then introduce a needle armed with a ligature just above the urethra at the root of the organ and tie a figure-of-8 with the ligature over the ends of the needle. You will succeed in this way in compressing the vessels and in stopping the hemorrhage.

EPITHELIOMA.

You recognize this patient as being the one from whom we removed the epithelioma from the penis by the removal of a portion of that organ. He has had no difficulty in urinating; the skin is pulling very nicely over the corpora cavernosa; there has been no constriction of the urethra and the wound has healed perfectly from the first. I think the operation which you saw me do is the best one for amputating the organ. Instead of dividing it straight across and allowing the urethra to retract so that the cicatricial tissue would form over it and cause a stricture as it naturally would do, I divided the corpora cavernosa a half-inch behind the point of division of the corpus spongiosum and the urethra, then split the two latter, antero-posteriorly, I stitched them to the integument with a stitch or two. In this manner you are able to get a much better result than is possible from the other method.

EPITHELIOMA DEVELOPED IN A SCAR.

John M., Victor, Montana, Age 36, American, prospector.

This patient is a very interesting case; came a long distance, nearly a thousand miles, to have us treat a bad limb that has been troubling him for three years. The limb was injured eight or ten years ago, and has been a source of much annoyance since that time. Two or three years ago it took upon itself this peculiar horny growth, which you see. The disposition for the growth to develop deeper and deeper, as well as to increase in circumference. It is of the same character as the trouble on the old lady's arm and that of the man's knee, both of whom were before you a short time ago. It is an abnormal growth due to the long continued irritation of scar tissue. It is apt to take upon itself the character of epitheliomatous tissue. In the case of the man's knee mentioned the growth was papillomatous. This may prove to be of the same nature.

I am confident that an amputation would lead to a rapid recovery, and that it would be the best treatment in this case. First, however, I shall try if possible to remove the growth superficially. If we can remove it without going too deep into the tissues, we shall do so and then cover the raw surface by Thiersch's method of skin transplantation. Of course it is well to save the limb if possible, for it will carry him about, if it can be saved, much better than any artificial limb that he could get; hence we will expose and see what we can do for it. It is very foul and offensive, as most of these conditions are. We will apply the Esmarch constrictor for the purpose of controlling the hemorrhage.

I am told that the patient prefers having an amputation at the thigh to having an operation which will be likely to confine him a long time; and I think he is right. I find the bone destroyed and an amputation is the best thing to be done for him, so we will accommodate him by amputating the limb at the thigh. It is always well, however, to make such an examination as I have made first, so that you will not be disappointed in showing the limb after its removal. Many times, good and famous surgeons make mistakes by failing to do this. To illustrate, a noted surgeon was called on to remove an angioma, which he thought to be too deeply seated to be removed, except by amputating the thigh. A surgeon friend happened to be present, and would not consent to the amputation until the tumor was opened. This was done, and the angioma peeled out of its capsule without any difficulty. But in this case we have satisfied ourselves that there is no local operation that will remove the disease, because it has extended to the bone and a recurrence is certain to occur in the near future. There is not enough healthy tissue below the knee to make the flaps, so I shall have to go above the knee, keeping as near the joint as possible. It is always well to have the limb extend over the end of the table, and if you are right-handed, always stand on the right side. We shall make the partial skin and partial muscular flap which we have illustrated to you so often. Operators not infrequently make the posterior flap too short. You will remember that when you make the posterior flap you begin a little in front of the angles of the anterior flap, and make it in the same way that you make the anterior flap. Give the knife a little sawing motion and it will cut better than it will if you give it a straight pull. These flaps should be reflected back to the point at which you expect to divide the muscles, and a little farther, including the superficial and deep fascia. You seize the limb just above the point at which you desire to make the flap, make the tissues tense, introduce the knife, make a few sawing motions in this manner and bring the knife out in this way. Introduce the knife in the same manner on the posterior surface and make the posterior flap. Now, reflect the tissues back far enough so that the flaps will cover the stump freely, make a circular incision through the periosteum an inch below the point at which you intend to divide the bone and shove the periosteum upward beyond this point. The periosteum and the flaps should be protected by means of retractors made of aseptic muslin while the bone is being sawed off. Then, having sawed off the bone, you search for the blood vessels. I think it is always well to separate the artery from the vein, although it has been shown that they do very well when both are included in the same ligature. Remember that the nerve should always be sought for, separated back into the tissues and cut off; you will then know that there is no likelihood of the occurrence of an amputation neuroma or pain from a compression of the nerve trunk in the cicatrices of the stump. The assistant, you see, is doing good in holding the soft parts well in place and not allowing them to retract from the stump. There is one objection to this kind of a flap, and that is that it does not allow the artery to be cut squarely off. The vessels are all ligated and the wound will be closed in the manner you have seen so many times. There is a considerable amount of hemorrhage from the bone. This can usually be controlled by pressure with a sponge. You see that these flaps come together very nicely, without any trouble whatever. In a wound of this size in the thigh there will be a considerable amount of serous exudation, hence we will introduce a rubber drainage tube.

Epithelioma of Face.

J. W. V., Plymouth, Ind., American, carpenter, age 75, has epitheliomatous ulcers on the face.

How long have you had these? About twenty years. How old are you? 75 years. Well, gentleman, you see the roughened character of this man's face and the disposition it has toward ulcerating and breaking down, especially in these three places.

He has exhausted all of the remedies that he could hear of and that had been given him, and he had been far and near all over the country to see different physicians in vain for a cure. Lately these spots have taken upon themselves the disposition to destroy the skin, and show a well marked infiltration around the edges. They do not heal, and I am inclined to believe that as far as internal or external use of medicine is concerned he will not be cured. Next comes the surgical treatment. His age militates against the operation which would require extensive incisions, and he refuses surgical interference. I have no doubt but that he would recover from the operation, but he does not wish to be operated upon. Then we must do something for his comfort. There are various things that we may do, and many things have been recommended. Salicilate of sodium applied externally in the form of a salve, always keeping the face perfectly clean, is one of the best applications he can make. Then I must not fail to call your attention to another remedy which may be beneficial to this man, and that is some preparation of arsenic. He can take it without impairing his digestion, and it will have some beneficial effects if any medicine will.

EPITHELIOMA OF LIP.

W. S. S., Hoopston, Ill., age 44, American, shoemaker.

This patient has an ulcer of the mucous membrane of the lip on the outer side of the mouth which shows no disposition to heal. There is not the disposition to crust over in this case, as there frequently is. These ulcers gradually increase in size not rapidly in depth, but in area. If an ulcer of this kind has existed only a month or two you will not be able to feel the hardened infiltrated edges, but if it has existed for three or four months you will be able to feel them in all parts around the ulcer. These conditions and the disposition to infiltrate the tissues in all directions are present here, so that the patient has an epitheliomatous infiltration of the lip. He has tried the usual remedies which are supposed to be of service, but they have failed. He has also applied two plasters which caused a slough. The glands of the neck became swollen from the irritation of the plaster. From the disease and from the plasters together the man has lost a large portion of the lip. The scar made by the plaster limited the growth of the ulcer for the time, but finally went on in its development, and broke down and has reached the condition which you see. Of course, he comes at rather a bad stage for the operation, much worst than if he had come before anything had been done for him. So much of the lip has been destroyed that it will necessitate some special operation for its relief and at the same time to provide for a lower lip. It is not necessary for me to say that this is a variety of carcinoma which it is possible to relieve. In operating you will go wide of the disease, not only of the ulceration, but of the infiltration as well, going into healthy tissue in all directions. This is absolutely necessary if you do not wish a return of the disease. I shall make a curved incision from the margin of the lip down over the chin and around on the cheek to a level with the angle of the mouth, going wide of the disease. All of the tissues are now removed down to the jaw. Then I shall make a second incision below the chin and parallel with the first incision and an inch and a half lower and slide the skin up after dissecting it away from the deep tissues, forming a lower lip and leaving the open space below the chin. This flap is held in its new position by catgut sutures extending through the subcutaneous connective tissue of the flap and the periosteum of the lower jaw. The flap is very vascular and the size of the vessels is increased by the disease. You can see that these parts are coming together and will make him a very good lip. The parts are very loose and that is a good feature of the operation. The raw surface below the chin will heal very well by granulation, or if it is large it can be covered at once with Thierchs' skin flaps. In doing any operation about the mouth like this put your patient in a position so that you are able to control him. The best plan is to anæsthetize him on a table. You are then able to manage him. In order to prevent all trouble do not undertake an operation of this nature without a sufficient number of assistants, and do not begin the operation until everything is favorably prepared.

This makes a very good looking lip. It will be dressed with iodoform gauze and sterilized cotton. A pad of gauze will be placed over the newly made lip and held in position by means of bandages in order to prevent it from sliding down.

EPITHELIOMA OF LIP.

Peter R., Rochville, Ill., age 70, American, farmer.

This old gentleman was before us last clinic for advice. He has a secondary manifestation of an epithelioma originating in the lip. We will remove the diseased tissue.

I am making this incision into healthy tissue; so far, I have not opened into the diseased mass.

I have now uncovered the entire submaxillary space. You can plainly see both bellies of the digastric muscle, the facial artery and the mylo-hyoid muscle. I have removed the submaxillary gland entirely. It is a comparatively easy matter to remove all the diseased tissue after exposing the muscular tissue in this manner. By examining the mass, now that it is removed, you will see portions of the healthy fibres connected with it, showing you that all of the diseased tissue has been removed. The probability is that in removing the submaxillary gland you will divide the facial artery. You will notice again, when examining the mass, that there is a smooth, grooved surface on its posterior part, which rested against the lower jaw. I am satisfied that it is infiltrated. There is, therefore, a very great probability that the disease will return in connection with the lower jaw.

There is so much tissue to be supplied here that I scarcely know where it will all come from. I desire to save as much of the mucous membrane as possible. The most of the hemorrhage comes from the opposite side of the face; some of it is from the internal maxillary and some from the transverse facial, but I do not think that it is important. You see the auricularis magnus nerve showing very plainly as it passes over the sterno-mastoid muscle.

The result of these extensive secondary operations is sometimes very surprising. I remember a case upon which I operated some three years ago, removing the entire cheek for carcinoma as I have done here. I transplanted skin over it. A few days ago the patient sent me his picture, and in the photograph you can scarcely notice any deformity whatever.

Of course, hair will grow on this face and it will largely hide any deformity that may be produced.

I shall now unite this portion of the flaps by applying the sutures transversely across the neck, preventing too much tension on the flaps by so doing.

This surface will be thoroughly washed and dressed with iodoform gauze and sterilized cotton and the head will be bent over toward the side from which the tumor was removed, so as to prevent too much tension on the flaps. You can see that the parts look a little white. But these parts are so vascular, that after dressing the wound in the manner I have described, it will heal without difficulty.

Notwithstanding that we sacrificed so much tissue, we have, as you see, succeeded in covering the wound completely. We also have a half inch or more of redundant tissue at this point which will draw down into the flaps and relieve the tension which exists.

You would not be able to cover this large area with the same amount of integument if it were on a patient less than 30 or 35 years of age, as the skin would not be so pliable as it is in this old gentleman.

SARCOMA OF THIGH.

S. J. Elliot, Iowa, Age 26, American, druggist.

This man has a tumor on the thigh which grew rapidly, reaching the size of a hen's egg, and was removed. That operation was performed about a year ago, and now the patient comes with another tumor about the size of a hen's egg in the cicatricial tissue. He has another complaint now; another tumor in the groin just above the femoral vessels. I can lift it up, yet it is rather firmly adherent to the deeper tissues. It is not separated into nodules, as it would be if it were made up of enlarged lymphatic glands. There is another evidence showing that it is not composed of enlarged lymphatic glands. There are enlarged superficial veins which you can see from quite a distance running over the surface of the tumor. Thus far it has the appearance of a malignant growth. When it was removed before it showed no evidences of infiltrating the skin, and was supposed to be a fibroma. The patient had all of the appearances of being entirely relieved of the disease. The stimulation of the operation evidently caused a return of the disease, making it malignant or semi-malignant in character. Its return has been rather too rapid to be what is termed a "recurrent fibroma." This form of tumor has the property of a malignant growth in that it has a tendency to return locally and in the skin. It has no tendency to infiltrate the lymphatic glands. I am inclined to believe that it is a sarcoma. The proper thing to do is to remove it.

You will find that it requires very careful dissection to remove a tumor of this size lying in this anatomical location, and endangers the large vessels of the part. I have now exposed the course of the femoral artery. At this point the sheath has been taken away. The same rule is observed here as is always observed where large vessels are endangered by the incision in the removal of a tumor. The structures, which are in danger of being injured, are first exposed and then the dissection is made away from these structures. In this case, I determined that the femoral vessels lay to the inner side of the tumor, and consequently I exposed the inner side of the tumor first. Had I removed the outer side first, the probability is that I should have wounded the vessels. It is impossible to prevent the division of these small arteries, given off from the main artery near the saphenous opening. Being divided so near the artery the hemorrhage is profuse, even from the small arteries, and requires a ligature. The mass has a very different character internally from what it did externally. You see that it extends very deeply into the substance of the muscular tissue, and I must follow it to the bottom. Its external appearance was that it was confined to the scar tissue and deep fascia, but the incision showed that it extended deeply into the muscular septa. Of course the patient would not have been benefited by the removal of the superficial portion of the mass. The only thing to do was to follow it, as we did, to the bottom and remove it completely. If any projections from the growth are left, there will in all probability be a return of the tumor.

Sarcoma Pressing upon Brachial Plexus.

F. S. S., David City, Nebraska, Age 40, American, carpenter.

This patient was before you last clinic suffering from a loss of function of some of the nerves of the brachial plexus from pressure produced by a small tumor located beneath the plexus. The nature of the trouble we do not fully understand yet. What we purpose doing today is to uncover the tumor, ascertain its character and remove it if possible. It is a peculiar case in that it has been aspirated and a whitish fluid withdrawn from it.

We have the shoulder depressed as much as possible and the head turned to the opposite side, so as to give us as much room in the triangle as possible. I now have the tumor pretty well uncovered. Those near by can see its conical appearance very plainly, the base extending downward and the apex upward. Here we have issuing from it one of the large trunks of the brachial plexus, and you can readily see how the tumor is causing pressure on this plexus. Whenever I touch the substance of the tumor, you notice that the nerve is stimulated, causing a contraction in the muscles which it supplies. This is evidence of the intimate connection between the nerves and the tumor.

I am obliged to go well down into the axillary space to get to the bottom of the tumor. Now that we have the mass exposed, what shall we do with it? I have succeeded in removing the nerves uninjured from the surface of the tumor and find that the tumor has caused a separation of the nerve fibres. I am satisfied that this is malignant in character from the manner in which the tissues are infiltrated and from the character of the fluid which came from it. I find that it projects down into the axillary space some distance, and I shall have to follow it. The tumor is developed from the anterior surface of the transverse processes of the cervical vertebrae. Growing outward from this situation it presses against the under surface of the brachial plexus, separating the fibres and interfering with the function of the nerves, giving rise to the patient's symptoms. The deep seated character of the mass has made it necessary to go down through all of the tissues to the cervical vertebrae at the base of the neck. I got behind the subclavian artery and vein so that I could press them out of the way; lying as close as these vessels did to the mass, it would have been a serious operation if this could not have been done.

FIBRO-SARCOMA OF THE ARM.

This lady has a tumor on the anterior surface of the arm, extending from the axillary fold to the bend of the elbow. I have made no previous examination. It has been four or five years in reaching this degree of growth. It is regular, smooth, and even and painless, and is one of those growths which resemble the tissues in which they are formed. It is perhaps a deep connective tissue growth, on the anterior surface of the arm proper, lying directly in the course of the biceps muscle. The skin and superficial fascia are not implicated, and it is exceedingly movable on its deeper surface. It is probably a fibroma, and is so large that it interferes with the motion of the arm. So we will make an incision and remove it. It does not implicate the skin, which is perfectly movable over it. It is not connected with the superficial fascia. We have now gotten down upon the biceps. I am rather inclined to believe that it grows from a deeper muscular tissue. I work slowly here as I wish you all to see. It would be interesting if it should prove to be a fatty tumor, as it would prove to you what I have often said, that lipomata will grow anywhere there is fat. I saw one once, as large as a potato on the end of a man's tongue; he was in the habit of carrying the tumor in his mouth. It was interesting to see him put it out, and to hear the peculiar sound he made in talking.

One of the most noted surgeons, Prof. Von Bergmann, of Berlin, examined this patient, and was unable to make a positive diagnosis until he cut into it and the fatty tumor rolled out.

While talking we have exposed the tumor, and it is one with peculiar characteristics. It grows in the biceps muscle. It is not fat, and I shall let you see microscopic sections of it next week. It looks like fibro-sarcoma. Here we have a deep wound in which the different layers of tissue will be united separately by three continuous cat-gut sutures. The wound ought to heal without any pus, unless some accident occurs.

LYMPHO-SARCOMA OF NECK.

Frank, 5138 Wentworth Ave., age 7, American.

You have heard the story of this case. The boy, seven months ago, first noticed a small tumor on the neck below the angle of the jaw. You notice how rapidly it has increased in size. It now lifts the lobe of the ear and extends downward as far as the clavicle. A close examination discloses the fact that the mass is made up of a number of lobes. The largest mass is immediately below the ear.

It is a case of acute lympho-sarcoma with an enlargement of the lymphatic glands of the neck. It is unusual to have such a mass form in two months. As a rule the disease which leads to this is chronic and slow in its manifestation. A very rapid course has been pursued in this case. There is a question here as to whether this may not be a common difficulty. We are apt to say that such troubles are due to the same pathogenic organisms which cause tuberculosis anywhere in the body, but a growth so rapid is much more like a lympho-sarcoma. The fact that the glands are so movable under the skin and that there are so many of them would rather point toward tuberculosis of the glands. Of course, there is but one thing to do surgically, and that is to remove as many of the glands as the eye can see and the finger detect. Yet it is an operation which is not likely to prove successful. In many cases, I have removed all of the glands that could be detected, and still there was a recurrence. This is due to the fact that the disease has already attacked some of the glands which can not be detected either by sight or touch and can consequently not be removed.

It is absolutely necessary to make a very extensive incision in these cases, in order to make the glands freely accessible, lest some of the smaller ones might escape detection. It will be necessary to lay bare all of the important arteries and veins from the angle of the jaw to the clavicle.

SARCOMA OF LEG.

W. F., 635 W. Van Buren St., Age 37, U. S., bookkeeper.

This patient was before you a few weeks ago with a tumor on the right leg the size of two fists. It has been growing for a year and a half, slowly at first and more rapidly later on. You remember that we explored the tumor and got nothing but a bloody fluid from it, and we pronounced it malignant. The situation of the tumor is on the fibula just below the knee, and the clinical symptoms are very plain as to the nature of the trouble. First, we have the rapidity of the growth; we note next that it grows deeply into the soft tissues and has no connection with the epithelial cells. The man has no other disease, so that it can be a secondary infection, it is therefore a primary trouble. The surface shows elasticity of the mass, not fluctuation, but a softness which makes it elastic. The surface, you notice, is covered by arborescent appearance of the veins showing that the deep veins are interfered with by the pressure of the tumor, and that their function is carried on by superficial veins, causing their much increased size which you see. Hence, the tumor presents all of the characteristics of a sarcoma, growing from the embryonal connective tissue cells of the periosteum. Originating in the periosteum, it is called a periosteal sarcoma. If its origin is in the bone it is termed an osteo-sarcoma. Situated as this tumor is, its pressure upon the veins of the leg interferes materially with the return circulation from the lower part of the leg and the foot which accounts for an oedematous condition of those parts. Palpation shows that the tumor is somewhat nodular, it is softer about its center and perhaps has broken down or undergone colloid degeneration. Believing that it is a sarcoma, there is no treatment permissible but to amputate the limb above the segment in which the tumor is found. The tumor being in the leg, the amputation should be through the thigh. Were it in the thigh, the amputation would be at the hip-joint. The operation should be as early as possible before there is much extension.

Now that I cut into the tumor, you see that it is entirely broken down, and nothing but this blood and chocolate colored fluid comes from it. Not infrequently a sarcoma connected with the bone is filled with fluid of this character. It is interesting to note how nature has formed a limiting covering for the growth, by throwing out calcareous matter which intermixed with the tissues, forms a dense capsule.

Fibro-Sarcoma of Abdominal Wall.

Mr. J. N. V., Clarence, Iowa, Age 50, married, carpenter, American. Habits and previous and family history good. Fairly nourished, muscular man.

Eighteen months ago, patient noticed a tumor in his right inguinal region. This has enlarged constantly and since the first four months very rapidly. It has given rise to much inconvenience and some pain. The right leg is oedematous. The tumor is hard and apparently pulsating in an upward direction, this, however, being due to proximity to and fixation over the external iliac artery. There is no aneurism. The femoral artery can be felt pulsating plainly below Poupart's ligament.

An incision 7 inches long and down to the transversalis fascia is made directly over the center of the tumor parallel to Poupart's ligament. The tumor, as large as a fist, is thoroughly exposed by a careful separation of the layers of the transversalis fascia and found lying upon and surrounding the external iliac vessels and covered by the iliac fascia. Its gross appearance is that of a sarcoma. After dividing the iliac fascia over it the tumor is easily dissected out, exposing the peritoneum and the external iliac vessels and leaving an enormous cavity. The wound is sponged out carefully and *united* throughout with deep catgut and superficial silk sutures. An iodoform, iodoform gauze and borated cotton dressing will be applied, and the wound will remain undisturbed for ten days, when the superficial stitches will be removed.

Sarcoma of Face.

J. M., Charles City, Ia., Age 37, American, farmer.

This is the case that was before you at last clinic with the tumor on the side of the neck. He comes now for its removal. He had a tumor removed seven or eight weeks ago, and it has now returned very rapidly. It is a sarcoma. This will, of course, be a bloody operation. The tumor being a secondary growth will not shell out as the first growths do. The operation will be principally in the submaxillary triangle of the neck. Your anatomical knowledge tells you the structures here to be avoided. You notice how prominent the external jugular vein is made by pressure of my assistant's finger. I shall probably divide this vein in the operation, and I have directed him to compress it immediately with his finger, to prevent the entrance of air when a deep inspiration is made. You see here now, very plainly, the submaxillary triangle exposed to view. In this location it is always best to expose the deep jugular vein first and then to work from within, outward, instead of going in the opposite direction. I have removed the bulk of the tumor. I must work very carefully for I am very near the pharynx, and as I do not wish to make a fistula here, I shall remove the slight amount of diseased tissue that remains with the cautery. You noticed that when I divided the facial artery, one part of it was in the tumor and the other upon the face and that the hemorrhage from each end was about equal. I have punctured a small opening in the internal jugular vein. I shall not try to ligate the entire vein, but shall lift up the portion containing the puncture and ligate it, in this way, ligating the vein laterally. Several years ago a paper on this subject was read before the American Medical Association in Philadelphia, in which ligation above and below and the removal of the perforated portion of the vein was advocated. I advocated that the procedure was more formidable than necessary, and that where the vein is situated in loose tissue, it could be ligated laterally in the manner mentioned, and I cited examples of successful cases. The idea was not taken to very kindly but I have gone on, nevertheless, doing the operation with success ever since and within the past year or two this method has been adopted by a number of surgeons both in America and abroad.

You see the pulsation of the external carotid artery very plainly. I have now cleaned this wound so that I see healthy tissues in every direction, except the little point which I cauterized, and here I have destroyed as much of the tissues as is safe. There is no doubt as to the nature of the disease.

In order to prevent the accumulation of blood beneath the skin, we will pack the cavity with iodoform gauze, which will be removed on the third or fourth day. In a small portion of the wound, the sutures will be left loose until the gauze packing is removed. Then they will be tied, and a pad will be placed over the skin to hold the raw surfaces in coaptation.

CONGENITAL ANGIOMA OF FACE.

Gracie S., 291 S. Morgan St., age 1 year, American.

We have a little babe with a red mark, three-fourths of an inch in diameter, on the right malar bone. It has been growing gradually from the birth of the child, when it was about the size of a pin's head, until it has reached the size which you now see. The growth has been more rapid of late. If you were to pass your finger over its surface, you would find that it is raised. It is of a port wine color. What is it? (Students answer): A naevus. We shall destroy these veins composing the growth absolutely by the use of the cautery, i.e., the hot needle, making a number of punctures. This is so large we may not be able to destroy it all at one sitting. Sometimes, where the naevus is large, it takes a number of sittings. You should never attempt to cure a naevus by injection of a coagulating fluid into its substance, for there are records of instantaneous deaths resulting from injections.

The burnt surface will be dressed by a film of flexible collodion. This will come away with the eschar in about two weeks. After this time the surface will be anointed with vaseline.

VENOUS ANGIOMA OF UPPER LIP.

Eva A., Dixon, Ill., age 19, American, housewife.

It never rains but it pours. It is not many days since you had before you a case similar to this. This lady has a tumor on the upper lip. `She has always had it. It is of a bluish color, and a close observation of its surface will show that it belongs to the blood vessels of the face. It is an angioma, smaller than the one which we removed, although this has been growing from birth, also. If I were able to turn the lip back, you would see that the mucous membrane is affected. You see that it has grown by displacement rather than by absorption of the surrounding tissues. The vessels of which the tumor is composed have developed, and have pushed the tissues out of the way. It is a venous angioma. If I were to compress it between my fingers, I could reduce its size materially. This can be very readily removed. I will make a conical excision, being careful to make the incision in the healthy tissue beyond the region of the angioma.

The two portions of the lip will be united by means of three deep silk-worm-gut sutures, which will include the entire thickness of the lip. Six or eight superficial sutures of fine silk will serve to adjust the skin and mucous membrane accurately.

The superficial stitches will be removed on the third day, and the deep ones after a week.

ANGIOMA OF FACE.

Sylvia M., Floyd, Iowa, age 14, American, school girl. Family history and previous history both good.

This case is that of the young lady who was before you a few days ago with the large angioma of the cheek. A careful examination shows that it extends up under the eye and down below the angle of the mouth. It is soft, and is made up of extremely dilated veins, implicating all of the tissues of the cheek. You see the bluish color of the veins through the skin, and when you turn the cheek outward, you can see the blood vessels through the mucous membrane in the same manner.

The pressure of the blood vessels has destroyed all of the soft tissues of the cheek, so that the cheek in its entire circumference and thickness is but a mass of dilated and tortuous veins, limited on the outer surface by the skin and on the inner surface by the mucous membrane, both so thinned out that the bluish color of the venous blood shows through them very clearly. In addition, this is demonstrated by the fact that pressure displaces entirely the contents of the tumor, which returns immediately upon its release. In itself, dilation of the blood vessels is not a dangerous condition, but in this instance, with this thin covering and the large sized blood vessels, the child is exposed to the dangers of a fatal hemorrhage upon any slight accident, which might sever their covering; besides, the deformity is great, and should be relieved, if possible, because so marked. As it is in such an exposed position, it is a source of constant annoyance and remark. There are three methods of treatment which might be adopted, all having for their object the absolute destruction of all the dilated vessels making up this tumor.

First—Subcutaneous ligation in sections around the circumference of the tumor, which I think would fail because the base of the tumor could not be reached by the ligatures.

Second—The actual cautery plunged into it in many places all over its surface, which I think would fail to act on account of the size of the tumor and the size of the veins.

Third—Complete excision of the mass, making the incision outside of the dilated blood vessels in sound tissues. This will be sure and safe, and entail the least amount of deformity. It is the method which we will adopt.

There is one structure passing through the cheek that we must try to avoid, and that is Steno's duct, extending from the anterior portion of the parotid gland through the cheek, and opening in the mouth opposite the second molar of the upper jaw. This should be done, if possible, in order to prevent the formation of a salivary fistula. So we will make an attempt to isolate Steno's duct, but we are not sure that we shall succeed. If we fail, the result is nothing as compared with the present condition of the child.

Treatment.—What I propose to do is to get as far away from the margin of the tumor as possible into healthy tissue, and lift it up from its attachments. The tumor will have to be dissected out piecemeal, and it will consequently be a slow operation. There is no use to think of doing rapid work in a case of this kind. I have gotten below the mass now, and very likely I can follow it up. I am trying to dissect the mass from the mucous membrane, because it will enable us to shut off the cavity of the mouth at once. If I succeed in saving it, it will be of great advantage, but it is so very thin that I may not be able to do this. I am trying to save this little portion of skin to help cover the wound; we will need every bit of it. Here is a little projection of the tumor that we shall have to dissect out. I find here under this little portion of the skin, directly beneath the lower lid, the nucleus of the original trouble. I think I have succeeded in avoiding Steno's duct. I shall unite these edges of the mucous membrane in the same manner as you would a wound of the intestines, turning the edges inward. There is not much to say when a man is doing an operation of this kind, for he has about as much as he can do to attend to the operation. When you undertake a thing like this, you must take all the time you need, and be sure to stop the bleeding as you proceed.

This patient has not lost enough blood to do him any harm. I did not know but that we might have severe bleeding, so I made preparations for treatment in case we did, by having a saline solution made. It is ready and would take the place of blood, temporarily. You can make a satisfactory solution by putting into 1000 parts of water, six parts of sodium chloride, two parts of sulphate of sodium and one part of bicarbonate of sodium.

This makes a solution which may be injected into the veins or subcutaneous tissues with impunity. It should be at the temperature of about 98 degrees. I do not know that it is necessary for you to remember these proportions, for I am sure that a teaspoonful of the ordinary table salt to the quart of water is just as good.

It is well to keep such a solution ready whenever undertaking an operation in which the patient is likely to lose much blood. It is a harmless fluid but should be injected into the body at the normal temperature of the body. In all cases in which you have serious loss of blood and you are in fear of your patient's condition you will remember that the use of this fluid is followed by great benefit, and it is taken up by the subcutaneous tissues very readily.

About a year ago I removed the entire cheek of a man who had a sarcoma developed in connection with the cheek. We were obliged to remove a large flap of skin and also more tissue than we have done in this case. So far there is no evidence of this return and there is but very little deformity. He did very well indeed. He had a fistula for a little while but that healed and he is well. In his case the entire mucous membrane was removed. Notwithstanding this fact, the patient did very well indeed. In this case I have saved so much of the skin that I shall not try to make any transplantation. Of course, these edges must be very carefully adjusted so as to get union as quickly as possible and in that way get vascularity of the parts established as soon as possible. I shall turn this flap across in this manner so as to avoid any tension. Each one of these flaps has a broad base and I am sure that the circulation will be maintained without any difficulty. I will put a little drainage tube in so as to drain off any bloody or serous discharge which is likely to form.

You see that we have united this wound without causing much deformity of the face. There is a small pucker at the corner of the mouth which will be smoothed by the process of healing and the lady will have a very pleasing appearance. At any rate her appearance is much better than it was before the operation.

NASAL POLYPUS.

In this man's nose you can see a growth forcing its way to the anterior nares. He is unable to breathe through either nostril and you notice as he speaks his voice has a muffled sound. He is suffering from nasal polypi, a form of myxomatous growth developing usually in the mucous membrane covering the middle turbinated bone, and as they grow drawing into and occluding the nasal fossa. We will remove them *en masse* if this pair of forceps which is introduced along-side the septum of the nose will open so as to include the growth. It will be carried up to its base which is grasped firmly and the polypus twisted off and withdrawn. Now, sir, I shall not hurt you much, take hold of the chair. This is a case in which there are a half dozen nasal polypi hanging in a bunch like grapes to their stem.

RECTAL POLYPUS.

John C., age 5, American, Chicago Lawn, Ill.

This is a very interesting case, and one that is of practical interest to you because you will frequently be called to treat just such cases. Some months ago this little patient would have a discharge of blood following the evacuation of his bowels, but it does not continue now. The mother noticed at times a projection from the bowel after his going to stool. I asked her if it appeared at the center or margin of the bowel, and if the child strained much to get his bowels to move. I have an object in these questions, for in children, although they may have hemorrhoids there is another trouble which will produce these symptoms perhaps more markedly than the piles. It is the presence of a growth in the rectum perhaps no larger than a cherry or the end of your finger, connected to the lining of the bowel by a long pedicle and is called a polypus. This disease is not infrequent in children. You will be helped to the diagnosis by the history given by the friends of the patient in that way learning whether or not the protrusion is centrally or laterally located immediately after the bowels move. You may be able to place the child over a vessel of warm water and be enabled to examine the parts yourself before they return, and in this way get a view of it. I do not suppose that I can see any growth of the nature of a polypus now. By spreading open the nates and everting the anus I am unable to see anything but a small hemorrhoid. I am therefore inclined to believe that it is hemorrhoids that has been troubling him. The treatment will be the same as in adults which you have seen so often. If it were a polypus, you would be able to feel it by introducing your finger in this manner· When a patient complains of these symptoms you cannot say at once that it is piles. You must make a differential diagnosis between piles, polypi, malignant growths and prolapse.

Tumor of Terminal Filaments of Plantar Nerves.

John Mc., 605 Congress St., American, steamboat agent, age 71.

This patient has a small tumor on the sole of his foot. It is now the size of a large walnut, having reached this size from the size of a pea when he first noticed it twelve years ago. Some days it is more painful than others; and it is more painful in the morning than at night. It is perfectly soft to the touch; there is no infiltration of the tissues. It is not a neuroma, for it is not hard and oval in shape, hence. I believe that it is an adventitious growth in connection with the terminal filaments of the nerves. It is not a callosity from the friction of the shoe termed a corn.

It should be removed freely.

Neuroma on Back of Hand.

Miss E. A., Chicago, age 32, American, musician, general health good.

This patient presents herself to us with a small, exceedingly painful tumor as large as a bean, on the back of the hand, between the second and third metacarpal bones. It has developed within the last six months, after prolonged piano practice.

It is a neuroma, and requires removal. The lady bravely consents to having it done without taking an anæsthetic. It is exposed by a short incision directly over it, picked up with a pair of forceps and dissected away. Two catgut sutures, and the application of an iodoform, iodoform gauze and borated cotton dressing complete the operation.

Lipoma of the Back.

Mary F., 90 Damon St., American, age 19, clerk.

(Q) What is your trouble? (A) I have a tumor in my back. (Q) How long have you had it? (A) Five years. (Q) Is it painful? (A) It has not been so except during the last few days. (Q) How large was it when you first noticed it? (A) It was about as large as it is now, and does not seem to grow.

As the lady has told us we find a little prominence on the left side of the spine. It slides under the skin and hence is not attached to the skin. The back is a favorite place for fatty tumors. This one as you see has been compressed by the clothing and has been prevented from rapid growth by bands of the clothing: we will see if it contains pus. In considering the kind of a tumor, always bear in mind the fact that all primary tumors of the body are made up of similar tissue to that in which they are found except in cases in which a portion of an embryonic layer has been included in one of the other layers. In trying to introduce the needle or knife into the back, remember that the skin in this region is thick and somewhat difficult to penetrate.

We will make an incision through the skin and superficial fascia directly over the center of the tumor. Now this mass of fat as large as a child's hand can be removed from its bed of loose connective tissue with perfect ease.

We will close the wound completely with a continuous cat-gut suture and seal it with collodion and iodoform gauze. It will not be dressed for two weeks when it will be perfectly healed.

Papiloma of the Skin.

W. A., Naperville, Ill., age 21, American, student.

This young man comes with a small fibrous growth developed from the skin. We will clip it off with the scissors.

When dividing a growth of this nature from its point of attachment, it is always well to lift it up firmly so that you divide the pedicle down in the deeper tissues.

The patient has, also a small tumor on the side of the neck just below the ear. I can lift it up between my thumb and finger. It is a collection of sebaceous matter which has accumulated as a result of closing of the duct. We shall open it and scrape it out as he is desirous of being rid of all his ailments. The tumor is so small that I am not sure that I have removed all portions of the lining, and as that is absolutely necessary, I now touch it with 95 per cent. carbolic acid to destroy any portions of it that have escaped the knife and curette.

Not infrequently you will meet patients with fibrous growths attached by a long pedicle, as in this case, which may be developed from any portion of the body. They are not always pedunculated, but sometimes are attached by a broad base. When they are pedunculated, as was the case here, they may be very readily removed by tying a thread about the pedicle. The thread will soon produce a slough and the tumor will drop off. You can employ this means when your patient is afraid of the knife.

Cystic Tumor of the Breast.

Mrs. J. M. S., Cassopolis Mich., age 36, American, housewife.

How long have you had this tumor? Nine years. I shall not hurt you. I shall be as careful as possible. This lady has a tumor of the mammary gland. It has been growing for nine years. When she first noticed it it was about the size of a hickorynut. It is now as large as a man's head. It is rather irregular in character, showing no disposition to ulcerate except at a few points where the clothing irritates it. I imagine that you will practice a long time before you see anything like this. This is an innocent growth as shown by its external appearance and its history. It shows no disposition to infiltrate the skin and it has been long in growing. It is a multilocular cystic tumor, of the breast.

There is but one thing to do in this case and that is to have it removed. It is attached by a mere pedicle and will be very easily removed. We will advise the lady to have it removed because it is a source of great inconvenience and because non-malignant growths often become malignant if left undisturbed.

Epiphyseal Exostosis at Upper End of Tibia.

A. T. J., Chicago, American, age 23, drug clerk.

This young man presents himself with a swelling as large as a good-sized potato and very similar in shape, on the posterior surface of the upper part of the leg. The growth evidently pushes all the muscles of the calf in front of it. It is hard and irregular to the touch where it can be felt underneath the edge of the muscles. It causes no pain or inconvenience, except from its size. It evidently is an outgrowth, bony in character, from the posterior surface of the upper part of the tibia, growing from the epiphysial cartilage. It belongs to the class of innocent tumors, and is technically called an exostosis. I cannot advise any operative procedure so long as it is harmless in its manifestations Should it at any time become a source of trouble through increased enlargement, I think it can be safely removed.

Exostosis.

Robert R., 30 Austin Ave., age 19, Welsh, blacksmith.

How long have you had this trouble with your arm? About two weeks. I used the sledge and had worked a little harder than usual the day that I first noticed it. I have not been able to work since, but it is getting better. I suppose a veterinary surgeon would call this a splint. You have seen horses that were lame from splints. We have here a localized periostitis on the posterior border of the ulna which has been more painful than it is now, and more painful at night. It is possible that the young man gave it a slight blow without noticing it at the time. He looks like a healthy young man. I have looked into his mouth, and have examined him sufficiently, and shall not ask any questions. This is not a gumma. They are more apt to come on in old sinners than in young ones, and more apt to come on the long bones, and especially on the clavicle. They are soft and fluctuating to the touch, and increase slowly in size, causing more pain at night.

Treatment.—The thing for this young man to do is to apply hot fomentations to the arm, and above all things else give it rest.

We will secure rest by applying a light, angular splint, and advising the patient to carry the arm in a sling.

Enchondroma.

Mary N., 869 55th St., Hyde Park, age 42, American, housekeeper. Family history and previous history good. Duration of present disease, 15 years.

You have a lump on the side of your face. How long have you had it? It has been coming for fifteen years, and causes pain. How large was it when you first noticed it? About the size of a pea. It is very sensitive. (Just above the angle of the jaw and below the ear). It is two inches in diameter and one inch thick, and is movable under the skin. There is no inflammation. The lymphatic glands are not enlarged. It is very close to the parotid gland. Not unfrequently you will find cartilaginous tumors of the parotid gland, and I should not be surprised to find that this growth contains cartilage. It is an enchondroma, and we would advise the lady to have it removed. I will make an incision over the center of the growth in the direction of the nerve fibres in this region, in order to limit as much as possible the resulting facial paralysis. I work carefully here, because it is so dark in the room. You can see the cartilaginous character of this tumor, and here is the parotid gland. I have uncovered the internal jugular vein. I am quite sure that you will meet with cases like this one, demanding your treatment, much more often than those requiring a formidable operation, and hence the minutiæ should be well mastered. The rule for the removal of all innocent tumors, and one that will carry you safely through an operation, is to keep the knife or the scissors, whichever you use, to the tumor. All innocent tumors are enveloped in a capsule, and if you keep close to and in the capsule, you will not sever any important vessels. You may also remember this: that all tumors that are movable are removable, and the greater the mobility the easier are they removed. This is a very important locality. There is the facial nerve which, if severed, would result in paralysis of the face. The jugular vein, the location of which you can fix in your mind by making pressure just above the clavicle, should be avoided. If you cannot avoid cutting it, ligate it and cut it between the ligatures, beginning the operation. You have here all the important structures of the neck, so you must keep close to the tumor, and so long as you do this it makes no difference where you are, you will not injure any vessels. Malignant tumors, on the other hand, you know have no capsule, except in some sarcomata. They invade the surrounding tissues in all directions, and hence, you would not expect to remove them without doing some injury to the nerves and vessels. You will make this fact known to your patients, and thus warn them of any trouble that may come from the operation.

FIBROMA OF PHARYNX.

Joseph V., Muskegon, Michigan, age 42, French, lumberman.

This patient is suffering from a tumor of the pharynx. Prof. Ingals performed a tracheotomy on the patient, and he is wearing the tube now. The tumor occupies the entire upper half, at least, of the pharynx. It projects forward under the soft palate so as to be seen through the mouth, and it projects upwards so far as to occlude the nasal passages, hence you see that it includes that entire cavity. The tumor is, therefore, a very formidable one to remove.

If we can reach the tumor from the mouth, uncover it, and remove it in this way, it will be so much better for the patient. Quite frequently the operation through the mouth fails, then we have to separate the upper jaw entirely. This makes a very formidable operation, and is to be avoided, unless the surgeon is compelled to do it.

In order that the hemorrhage may be stayed, and the patient thus prevented from being choked from the dropping of the blood into the larynx, all these operations for the removal of large tumors of this character are proceeded by tracheotomy. This permits of the packing of the lower portion of the pharynx with gauze to shut off the hemorrhage.

I find that I shall have to separate the palate before I shall be able to remove the growth. I have now gotten the posterior nares open, and I find that the tumor is made up of a rather soft mass, which it is impossible to remove completely without thoroughly curetting it. I am now removing some portions of the tumor from the base of the skull, which I can not reach quite so easily as I do the rest. I can put my finger into the posterior nares without any difficulty, and I am sure those passages are free. I now have the tumor removed from the anterior surface of the spinal column. These pieces that I am removing now come from the roof of the pharynx, which you know is from the body of the sphenoid bone. You can now readily see how extremely difficult this operation would be without first doing a tracheotomy. I have succeded in removing the mass through the mouth, a very much less formidable operation than the one I mentioned of separating the jaw.

I am afraid that this disease is one which this operation will not cure. It will, probably, only give him a breathing spell. I fear that the microscope will confirm the diagnosis of sarcoma. At the bottom of the wound the anterior common ligament of the spinal column can readily be seen. I am closing the soft palate which I was compelled to divide. This tumor has come down so low in the pharynx that it has implicated the tonsil. I merely mentioned this to call your attention to the fact that in removing tumors in the locality of the tonsil, you must be very careful not to injure the internal carotid artery. This vessel is separated from the tonsil by the walls of the pharynx only. Of course, if you should open this vessel it would be a serious accident. It would at least require the ligation of the common carotid artery, for there is no packing that can be applied which will stop the hemorrhage. The current is so direct that no pressure can be applied except that of the finger, and that directly to the opening, to control the hemorrhage. I have disturbed the mucous membrane of the nose a little, and we have a little bleeding from the nose, which will soon cease from the pressure of a little iodoform gauze.

My assistant tells me the long continued use of the gag in the mouth, together with the motion required in the removal of the tumor, has caused a dislocation of the lower jaw. It is a very easy matter to reduce a dislocation of this kind by putting the thumbs in the mouth of the patient, pressing downward with them, and at the same time pressing upward with the finger on the chin.

It is quite possible, as you readily see from this operation, to remove quite a large fibroma from the pharynx by dividing the soft palate, and, if necessary, the hard palate and the jaws. Then, dividing the coverings of the tumor, seize it with the Volsella forceps and peel it out of its capsule. You know that fibromata here, as well as in other parts of the body, have their own capsule of connective tissue, and they can be enucleated even easier than fatty tumors. We will cauterize the entire surface to which this tumor was attached with the Paquelin cautery, and then pack the pharynx with iodoform gauze.

EPULIS.

Mrs. S. E. S., 329 Flournoy St., age 47, American, housewife.

This patient was before you at the last clinic, but we did not have time to perform the necessary operation; so she comes to-day to have a tumor in connection with the roof of the mouth removed. There is not much to be seen in an operation of this kind. We will place the patient in Roser's position, which we advise in all operations about the mouth, nose or pharynx, i.e., in the dependent position of the head, so that the roof of the mouth is the lowest portion of the respiratory or alimentary tracts, thus giving the blood a chance to flow out of the mouth instead of flowing into either of these passages. I think that by holding the mouth in this position the most of you, even at quite a distance, can see the nature of the growth quite plainly in the mouth. It is as large as a quail's egg, and is growing from the under surface of the hard palate. It is hard, glistening and smooth in character, and I am satisfied that it is an innocent growth, which we shall probably be able to remove without any great difficulty, and which we shall find to be composed of dense fibrous tissue. The upper portion of the tumor is really attached to the alveolar process; hence I am satisfied that it is of the nature which I mentioned to you the other day—that of an epulis. There is quite severe hemorrhage. This tampon of antiseptic gauze which we will pack into the cavity, will soon become fixed n the cavity, and in that way stop the bleeding, and at the same time will make a sufficient dressing for the wound.

Now, that I have opened the specimen, it does not look so pleasant as it did before. You notice that the growth is somewhat cystic, made up of a number of cavities, the trabeculæ of which are composed of dense fibrous tissue. This may possibly prove to be malignant, but a microscopical examination will be made and will determine the character of the growth definitely.

EPULIS.

Mary D., 26 Allington Place, age 12, Irish, school girl.

This little girl has a growth springing from the alveolus, extending from the canine back as far as the last molar. One molar and a bicuspid were extracted. The margin of the gum is three times its natural width, and has an appearance peculiar to epulis. It grows down on the outer side of the gum. The thing to do is to extract the teeth and remove the growth. It is an epulis, and is classed among the innocent connective tissue tumors, and if removed completely will not return.

The tumor grows from the periosteum covering the alveolar process. It is, consequently, advisable to remove this process together with its periosteum by means of a chisel.

The wound bleeds freely, but the hemorrhage can be easily controlled by packing the space tightly with iodoform gauze.

The patient will be advised to rinse her mouth every hour or two with a solution of one part of alcohol in three of warm water. The wound will be entirely healed in two weeks.

SEBACEOUS CYST BELOW EAR.

H. E., 632 Adams St., Chicago, German, age 28, engineer. Family history and previous history good.

Well, sir, what is your trouble? I have a lump on my face. How long has this lump been growing? Seven years. This patient comes with a little lump at the angle of the jaw. It is very movable under the skin and does not give him pain. It has some of the appearances of a sebaceous cyst. You remember that sebaceous cysts are caused by the closure of the ducts of sebaceous glands. From the fact that this tumor has been here so long, and has been of such slow growth and does not give pain, I am inclined to believe that it belongs to the class of innocent tumors. The treatment indicated is to uncover it by an incision directly across its highest part, and to dissect it out of its bed. Picking the tumor up between my thumb and finger, I find that it is freely movable, and that it is connected with the skin by an elongated attachment. This is one of the tumors in which it is absolutely necessary to get out all of the cyst wall. If you do not succeed in removing it all, the tumor re-forms. When these growths are situated on the scalp, there is no difficulty connected with their enucleation, for they are developed in the loose tissue of that region, and you can separate and remove them without any difficulty whatever. When they are found on the face or neck, they are removed with more difficulty, because all of the subcutaneous tissue must be dissected away from the cyst wall. We have now dissected all portions of the sac from the tissues in which it is imbedded. The wound is closed by stitches, and dry dressings are applied.

SEBACEOUS CYSTS OF SCALP.

C., Richland, Ill., age 72, German, farmer.

This old gentleman has a number of small tumors upon his scalp, as you see. They are smooth and soft to the touch. The skin is not implicated in the growth. They have been growing for many years, and have caused him no trouble, except by their disagreeable appearance. They are sebaceous cysts, caused by the occlusion of ducts of sebaceous glands, causing an accumulation of the secretions of these glands. I have told you that they are easily removed when they are found in the scalp, and that in this position they are not attached to the tissues except at the very top of the tumor. The method of their removal that I have adopted is to pass the knife through them, splitting the cyst in two, to introduce the director at the base and pull it around between the sac wall and the skin. You can quite readily do this; then grasping the deepest portion of the sac with forceps, the entire mass can be lifted out. I think this is a much better way than to undertake to dissect them out. When you incise the skin over a small cyst, it falls out quite readily, as this one does. This is a large one, but I shall not attempt to remove any of the skin. It will all contract. The contents of this cyst is partially fluid in character. It is of the kind that frequently ulcerates on its external surface, and assumes the appearance of a malignant tumor. You are to remember that every portion of the cyst wall must be removed. This man has another trouble which concerns him more than these cysts. He has a tumor just below the left ear. It has been removed once, but shows a disposition to return. We will have more difficulty in removing it than we have in removing the cysts. It will not separate from the skin, and shows a disposition to grow and to infiltrate the surrounding tissues, having all of the manifestations of a malignant growth. It is in an unfortunate position. Just above it is the facial nerve, which, of course, we desire to avoid, but we may be obliged to injure it. I am not at all positive that this growth will not return. In fact, I expect it to return. Now we have removed it, and I think we have missed the nerve.

RANULA.

Mrs. O., Austin Ave., age 30, American, housewife. Family history and previous history good. Duration of the present disease, eight months.

Some of you will recognize this lady. She was before us last Tuesday, and presented a very beautiful case of ranula as large as a walnut. It is a large cyst formed by the occlusion of the duct of some of the mucous glands underneath the tongue. It had grown so large that the tongue was pressed against the roof of the mouth. The tumor was a little discolored. I made a large opening into it, allowed the fluid to escape, and then packed it with iodoform gauze, as much as would represent the size of a walnut. The patient became nauseated, and she removed the packing about 8 o'clock that evening. This is the first time I ever heard of iodoform acting in that way. It was quite unfortunate for the patient that the gauze was removed. She was very much frightened by the operation, and the discomfort from the gauze would have soon passed away.

Treatment.—There are different methods of treatment, but the tendency is for the cyst to refill. But in all cases in which I have removed a piece of the wall, and had the packing left in the cavity until this has healed from the bottom by granulation, I have secured a cure. Practically this is well. The walls of the cyst have adhered, but the accumulation may return.

REMOVAL OF ENLARGED THYROID GLAND.

Preceding my remarks, I shall show you a patient from whom we removed the gland and shall also show you a number of glands which we have removed. The specimens which I pass about will give you an idea of their size and appearance when enlarged. In the first place it may be well for me to say a word about the Surgical Anatomy, in order to impress upon you its importance in avoiding the nerves and vessels during an operation. You know that the arteries supplying the glands are the superior and inferior thyroid arteries. The superior thyroid supplies the upper portion of the lateral oval mass of the gland and the inferior, the lower portion of the mass. These arteries anastomose freely with each other in the side which they supply but not with the opposite side. In other words the two sides of the gland are distinct, unless the third artery, the thyroideaima, which usually arises from the arch of the aorta, passes up the anterior surface of the trachea and is lost in the substance of the gland, unites the two sides. When the gland is enlarged the division of any of the vessels, which are also enlarged, gives rise to hemorrhage which is difficult to control.

The other vessels are the veins. I do not call your attention to the common carotid artery, for all of your operative procedures are so far away that there should be no danger of injuring it. Of course, on either side you have the anterior jugular and the laryngeal veins running over the surface of the tumor. The veins will concern you more than anything else, because they will be immensely enlarged. Veins having no name, anatomically will have formed and will be of large size, oftentimes as large as a lead pencil. These veins not only have greatly distended walls, but the walls have become attenuated and brittle, so that the slightest touch will break them; and once broken, you will be surprised at the great amount of hemorrhage from them. Before the day of haemostatic forceps, when the surgeon had to depend on skill and dexterity, the majority of these cases met with death, from hemorrhage. This shows you the difficulty of controlling hemorrhage, and warns you against undertaking an operation without providing yourself beforehand with all necessary apparatus for any emergencies which may arise in the course of the operation. Besides the veins mentioned you will bear in mind the internal jugular. Now, with reference to the superior thyroid artery, you know that when the gland is contracted and of normal size, the vessel enters its upper portion, but when the gland is enlarged, all is changed, instead of entering the superior portion it enters from below, altogether different from the relations which you find in your dissections.

The inferior thyroid artery you remember is the guide to the recurrent laryngeal nerve. It is a branch of the thyroid axis, and the subclavian artery, from which it arises, is just beyond it. As the inferior thyroid artery ascends to the gland it becomes intimately associated with the recurrent laryngeal nerve. This nerve you remember supplies the muscles of the larynx, and is very important; if it be divided, the muscles on the affected side are instantly paralyzed. The division of the nerve causes collapse of the glottis. You will remember, too, that the point where the artery turns to run across the gland is the point where the inferior thyroid is ligated.

Another nerve of importance is the superior laryngeal, which supplies the pharynx with sensation. It lies in the course of the superior thyroid artery and of course should be avoided. When the gland is enlarged and it is necessary for you to remove it, you will usually be able to prevent much hemorrhage, by finding the vessel in its distribution and seizing it with forceps, then the next division in the same way, and the next, and so on before their division. You will also prevent hemorrhage by keeping outside the substance of the gland.

You remember the trachea in its relation to the gland. You know that the gland is made up of two lateral masses and a central portion uniting the two, called the isthmus. Not infrequently the enlarged masses of the gland extend around the sides of the trachea and become adherent to its surface, as you can see was the case with this specimen which I show you. This specimen also illustrates the fact that the lobes of the gland develop in such a way as to make pressure on the walls of the trachae, almost shutting off respiration. The trachea is very loose and care must be exercised in manipulating the gland, that pressure is not made thereby on it and respiration interfered with. .

Perhaps this is all that is necessary for me to call your attention to in regard to the anatomy of the gland, unless it be to the coverings of the gland. We have first, of course, the skin and superficial fascia. Below this is the platysma myoides muscle, then we come down upon the deep fascia, and upon removing this obstruction we reach the sterno-hyoid and the omo-hyoid muscles, very thin muscles termed "ribbon" muscles. When, however, they are enlarged as you will often find them, it is almost impossible to recognize them. Finally you come to the fibres enclosing the gland, itself. It is very important that you bear in mind all of the relations which I have mentioned every moment of the time while you are operating. You can divide the tissues immediately over the gland with extreme care, avoiding the important structures already mentioned.

This patient comes before you showing the result of an operation in which the entire thyroid gland was removed. She was suffering from difficulty in breathing at all times, but especially when lying down. She had been troubled for 25 years in this way, gradually growing worse notwithstanding almost constant treatment until, unable to bear it longer, she came and had the enlarged gland removed. You notice the nature of the incision in this case, it was sufficiently extensive to enable me to enucleate the mass without any great difficulty. The patient is now entirely relieved of her disagreeable symptoms and is cured.

Now that I look at this tumor, I have called to mind another complication, and that is, that these growths are very likely to be supernumerary. In this specimen which I have in my hand, you see its "spread eagle" shape. After removing, it there popped out of the neck on the under surface of the gland, this great mass which could not be diagnosed at all before it made its appearance, because it was underneath the sternum. The mass was readily removed and on its under surface was a distinct groove which had been made by the arch of the aorta. That case also recovered without difficulty. Again, we have what is sometimes called a supernumerary gland, some distance from the original gland. Here is an example of this kind. Some time ago I removed a tumor from behind the sterno-cleido-mastoid muscle, and upon microscopical examination, it was found to be composed of tissue resembling that of the thyroid gland. A number of similar cases have been observed by other surgeons

I do not know that it is necessary for me to say anything about the pathology of the organ. Your comprehension of the pathology of it will depend largely upon your knowledge of its minute anatomy. The gland is made up of a capsule and a stroma. The capsule sends down trabeculae which divide and subdivide the stroma into lobules which, in turn, are made up of vesicles lined with a single layer of epithelium. The vesicles may become filled with a colloid material which may lead to pockets of the same. Very frequently they become arranged in nodulated masses as a result of the cicatricial tissues which form about them. The gelatinous, viscid fluid sometimes becomes more liquid, collects, forms an extensive cavity and is surrounded by its own cicatricial tissue, forming a cystic condition of the gland. The trabeculae take upon themselves an enlargement and you have a fibroma resulting. It may be adenomatous, or the blood-vessels may take upon themselves a peculiar condition giving rise to the vascular variety.

However they are produced, a careful examination will usually tell their nature, and whatever be their effect is what concerns you most surgically. When they increase to a large size, and are hard, they make pressure on the trachea and interfere with respiration, the voice becomes husky, and deglutition is also impaired. But the most pronounced symptom is the interference with respiration. When the gland reaches this large size, surgical interference for its relief is necessary both to relieve the symptoms and for its cosmetic effect. The neck is exposed to view, and every one sees it, causing not a little annoyance to the sensitive woman.

Many cases of enlarged thyroid glands are of a nature which are apt to reach the extreme size of the true hypertrophied gland. These glands are amenable to such treatment as the external application of the tincture of iodine and the iodide of potassium internally. Certain good surgeons report excellent results by exposing tumors to heat, as that of a fire or the hot rays from the sun. Then, again, certain injections with hypodermic syringe, or the trocar and canula, of fluids like carbolic acid, ergot and alcohol, or a 10 per cent. solution of iodoform in glycerine, have been followed by relief, and in some instances by cures. Of late years, the hypodermic injection of five per cent. carbolic acid has been my favorite remedy for this variety. You will always try these remedies before rashly undertaking an operation, but you will sometimes be surprised to find that these remedies will have but little or no effect, and it will be necessary to resort to an operative procedure.

When you have decided upon operative treatment, there are a number of things to be borne in mind. Until a few years ago, when antiseptic precautions were adopted, operations on the thyroid gland were considered the most formidable, and were frequently followed by death on the table. The operation had to be done quickly. Great, strong, waxed linen thread, such as shoemakers use, was employed to ligate *en masse*, and great strength was used in tying it. Infection was of common occurrence in the cases which did not succumb to shock. A septic mediastinits was likely to follow, and cause the death of the patient.

The formidable operation of removing the entire gland is begun by making an incision over the surface of the gland in such a way as to give plenty of room to control the tumor. The most convenient incision is a bilateral one, extending down the lateral mass on one side, across the mass below, and up the other side through the skin and superficial fascia. The deep fascia is then carefully divided, and you come upon the fascia covering the tumor itself. You divide it on the grooved director, and separate the tissues from the tumor with your fingers, first on one side and then on the other. The superior thyroid is seized and controlled with hæmostactic forceps. Remember that the thyroid gland is exceedingly vascular, and that both ends of the artery must be tied. Follow down the side of the lateral mass of the gland, find the inferior thyroid artery, and secure it. Turn the tumor over carefully, sever its attachments with the trachea on that side, then do the same thing to the arteries and attachments of the other side. This is done when you remove the entire gland. It is not always possible to do this, however, and you may enucleate a portion of it, after reaching it in this way, by making one or more incisions into it, and removing, with the finger or curette, all of the loose material. Hemorrhage may be controlled by the use of a constricting band, applied as you have seen us do sometimes in cases of a fibroma of the uterus. If a cystic tumor has reached the size of a hen's egg, it will have its wall, and can be turned out. The cavity is then packed with iodoform gauze. That is the method of enucleation, and a cyst may be removed entirely without hemorrhage. The same process is carried out by the use of the actual cautery.

There is another condition which I should mention, and that is an enlarged condition of the blood vessels, giving to them the appearance of an aneurism. The tumor pulsates as does an aneurism. This condition is found to be attended with a nervous trouble. There is a protrusion of the eye-balls and palpitation of the heart. This form is termed exophthalmic goiter. It has been treated by the removal of the entire gland.

I have told you that the great danger in removing a thyroid gland is that of hemorrhage. However, this can be prevented. There is not a man in this room who can not control hemorrhage during the removal of a gland. This is done by securing each vessel before it is divided, then you will be able to do this formidable operation with the loss of but an ounce or two of blood. In case hemorrhage should occur during the operation, notwithstanding the fact that these precautions have been taken, it can be temporarily controlled by grasping the gland between the thumb and fingers and elevating it until the vessels can be caught in hæmostatic forceps.

The next danger is that of sepsis, simply because you are obliged to open the large, loose cellular spaces in the anterior portion of the neck which communicate with the mediastinum. Infective germs are likely to find their way into the mediastinum, and the patient dies of acute septic poisoning. Therefore, you will never approach an operation of this kind until you can swear that you have carried out all of the rules governing an antiseptic operation. I have already mentioned the danger of dividing the inferior laryngeal nerve. The other laryngeal nerve might carry on its function in a degree, but if the greater accident of dividing both nerves should occur, the result would prove fatal. Of course, the large vessels are in danger. If you should injure the internal jugular vein, you would ligate it at once, of course. It being large, you would ligate in two places, above and below the injury, and cut it between the ligatures. The pneumogastric nerves are to be avoided, of course, as their division might be fatal.

In regard to the cosmetic effect, we may say that your incision should never be transverse, for such an incision will always show. But if you make the incision which I have mentioned, it will leave the least scar, and at the same time will give you an abundance of room.

Now, with reference to that dreadful disease called myxœdema, or cachexia strumipriva, associated with a degeneration of the nervous system, a loss of intellect, and a general physical weakness. Myxoedema was first described by Sir William Gull, and later by Sir William Ord, both of London. It has recently been studied with great care by Prof. Kocher of Bern. These men discovered that in the lower animals the disease is due to a deposit of mucin in the connective tissues. The human subject with this disease becomes thick lipped, and his tongue and cheeks also become thick; he has the appearance of anasarca, but his tissues do not "pit on pressure," hence, there is a difference.

It is said that the entire removal of the gland is followed by myxoedema. This is not true in my experience, however, you should always leave a portion of the gland if you can find a sound and healthy portion which may be left.

GOITRE.

The six patients now shown to you are all illustrations of the enlargement of the thyroid gland, technically termed goitre, or bronchocele, or struma.

The points in diagnosis are, first, its position in front of the neck; second, its shape, spread eagle, a small body in the center and large wings on either side; third, it rises and falls with each act of deglutition, as I illustrate with this patient, because it is normally fastened to the trachea.

The growth may be unilateral, bilateral, or central, according as one or both lobes or the isthmus, or all three are the site of the manifestations of the disease. The growth may be cystic, single, or multilocular, adenomatous, vascular, or fibrous; or the tumor may be a sarcoma or a carcinoma of the thyroid gland. Again, we are often called upon to treat cases of enlargement of the thyroid gland associated with bulging of the eyeballs and distressing pulsation of the large arteries of the neck. Such cases are termed exophthalmic goitres.

The cases before us are all examples of cystic or adenomatous enlargement of the thyroid. We have fallen into the habit of treating these cases by the weekly injection into the substance of the gland of a drachm of the 5 per cent. sol. of carbolic acid in water. This treatment is followed by a rapid diminution in size in many cases, and a perceptible improvement in all who have regularly returned. I have added to this treatment the use of 5 drop doses of Donovan's sol. and 10 drop doses of Tr. strophanthus three times a day, with what benefit I am not yet able to state.

I do not know the exact number of patients we have treated by means of hypodermic injection of 5 per cent. sol. of carbolic acid but it must by this time exceed one hundred cases and you have all noticed the improvement in the different cases from week to week. The percentage of complete recoveries is large.

TREPHINING FOR EPILEPSY.

B. G., Utica; Ill., Age 36, American, mechanic.

The patient before you is a man 36 years of age who is suffering from a complication called epilepsy, a sickness which is characterized by a loss of consciousness and motion and a peculiar spasm of the muscles.

There is always present in these instances an excitable nervous center in the brain and a second factor is a periphoral irritation-cortical excitability. It has been proven clearly by repeated observations that a certain irritation of the brain will produce epilepsy.. But I merely mention this as a fact in passing as a point which seems to justify surgical interference. There are cases on record in which the removal of such irritating causes has relieved the epilepsy. Other cases of epilepsy are on record which recovered from their disease after operations upon other portions of the body, for instance after removing necrosed bone of the tibia in a case of osteomyelitis. The amputation of extremities, the opening of abscesses, removal of ovaries, removal of scars and many other operations have been followed by similar results.

Surgeons have long known that injuries about the head lead to this condition of epilepsy. It is not an infrequent sequela of fracture of the skull, and particularly certain kinds of fractures of the skull, such as a punctate fracture in which the edges are accentuated and circumscribed, as from a fall on the corner of a brick or nail. Here the force is circumscribed, is confined to a small area and the pressure is directed internally upon the membranes of the brain and often lead to inflammation. Again, surgeons know that epilepsy is a sequela of a thickening of the bone by an abnormal development of it without the occurrence of a fracture. The cancellous diploe and inner plate lose their normal appearance, becoming thicker and harder, sclerosed, if I may use the term, and more bony tissue projects into the sulci of the brain than normally. Another change which may take place is a thickening of the bone which at the same time becomes very porous and spongy, producing a condition known as osteoporosis. Any of these conditions may go on developing in the interior of the cranium. Such conditions occasionally form osteophytes, small bony developments sometimes an inch in length, which irritate the tissues with which they come in contact. When this is the case the seat of the trouble comes to be the point of peripheral irritation and any surgical interference which does not remove the osteophytes will fail.

This unfortunate man has an injury of the skull which he received when a boy by a fall from a tree. Seventeen years after receiving the injury he began to suffer from epilepsy, since which time it has been increasing in severity. He has already been trephined without obtaining any relief. He is now in such a lamentable condition so far as the epileptic seizures are concerned, that he wishes to undergo another operation. We feel inclined to let him have an operation for the reason that the first operation did not elevate all of the portions of the skull which were depressed by the fracture. If you undertake one of these operations, you should be provided with means to elevate all portions of the depressed bone, for there is nothing that will tell you which portion of the depressed bone is causing the irritation, or is the cause of the trouble. Here is a very well marked depression marking the opening made by the button of the original trephining.

Running upward and outward from this depression is a well-marked sinking in of the skull, showing that this was not a punctate fracture, but that a considerable portion of the skull was depressed. So we will not predict that the patient will be absolutely and positively relieved, but from our knowledge of such cases we have every reason to believe that his condition will be improved. Instances of this kind are on record resulting in a cessation of the epilepsy by removing the irritation with the trephine after the disease has existed 20 years. In order that we shall be satisfied that a cure has resulted from the operation of trephining, it will be necessary for us to wait a considerable length of time, for it is a strange but apparent fact that almost any operation for a trouble of this nature will give the patient relief for the time being. The new irritation on the nerves due to the operation seems to take the place of the old. Hence, the permanent benefit must be verified by time. It is best in these cases to make the horseshoe flap incision. The flap is made large enough to embrace a little more than the entire depressed area of the skin and the incision goes directly down upon the bone through all of the tissues.

I have a little more difficulty here on account of the cicatrices of the original trephining than I otherwise should, and I must therefore be more careful in separating them, lest I might injure the coverings of the brain

Now you see, with the use of the chisel I have succeeded in removing this large piece of bone without any difficulty and without any injury whatever to the brain or its membranes, and it has been just as surely done as with a trephine. We trephined a case before the students in this amphitheater a year or two ago in which we found the bone so osteoportic and so thick, that the trephine would not reach to the bottom of it. So that we had to remove the first button and then substitute the chisel in order to complete the opening. That condition not infrequently follows injuries of the skull, but not to such a degree, except in rare instances. I have come to more evidence of disease just here at the posterior inferior angle of the wound than in any other part. Here is an outgrowth of the nature of an osteophyte growing directly into the membrane in this position. One has to use a considerable amount of care in lifting it out not to tear the membrane. Of course, the patient's trouble may come just here where the cicatrix has been found as a result of the old operation, and I have to go carefully or I may tear into the brain. As it may be the source of the convulsions, I am now loosening it up thoroughly. You must listen to the sound of the chisel as well as to notice carefully regarding the amount of force used. When one has separated the continuity of the bone, the sound given off indicates this having been done. The membranes fill up the cavity that I have made in all directions. I can feel the pulsations of the brain very distinctly. If we were trephining for an abscess, the membrane of the brain would bulge up into the opening, would be changed in color, being lighter, and would not show this pulsation. Now, I intend to remove a portion of the cicatrices which have formed in connection with the dura mater and the pericranium, in this way getting rid of a series of convulsions which might come from irritation from these cicatrices. Not infrequently such cicatrices are the cause of the trouble.

Under these circumstances the patient will complain of signs or premonitions of a burning sensation in the scar or a darting pain or flashes of light etc: Immediately following which there will be a convulsion. This man has a premonition of a flash of light before his eyes and then the convulsion immediately follows. Others have premonitions in the form of certain muscular spasms as, for instance of the little finger, wrist or hand. These are found in what we call the Jacksonian epilepsy. In this form of epilepsy the indications are always to trephine, for you have a certain seat for the disturbance, which in the supposed case above would be in the ascending frontal convolution of the brain.

Now, I have removed all of the cicatricial tissue resulting from the healing of the original wound and I am now smoothing off the edges of the opening so as to be sure that there are no spiculæ of bone extending from the internal table inward toward the membrane. You see that this area is very considerable in extent and it will certainly relieve the pressure to a greater or less degree and will in that way be a benefit to the patient, especially if we have gotten away all of the osteophytes that have formed. The probability is that we have succeeded in this and that we shall be rewarded by a recovery. This flap is made in such a way that its widest part is most dependent when the patient is in the recumbent position, and a good condition for drainage is thus effected. Of course after such an extensive operation there will be a good deal of oozing. The manner of making your flaps, as I said in the beginning, will depend on whether or not you return the button to the wound after the operation. If you have the wound open and do not return the button, then the incision should be made directly down upon the skull through all of the tissues including the periosteum. By the use of the periosteum the flap is elevated from the bone. But if you expect to return the button, it is best to leave the periosteum attached to the bone, so that the periosteum of the button will furnish attachments for the surrounding bone. In a number of these cases where the button has been returned there has been sloughing and a portion of the bone came away with the slough. But of course, if there is a part of the bone which remains, it is a benefit. We shall not try to return the fragment of bone in this case, but what we shall do is to introduce a few strands of aseptic catgut under the flap to act as a drain for the serum and blood which will accumulate beneath the flap. Another benefit from this kind of a flap is the good support which it forms. I will catch this bleeding vessel in the line of the suture and shut it off. This method will stop the hemorrhage in every one of these instances, so it is not necessary to tie the vessels separately which are found in the line of the incision. However, if the bleeding troubles you in your work, then it is well to tie the vessels.

I have used the chisel today, for I was satisfied that it would be more expeditious and by its use I could remove just the amount of bone I desired. Had I used the trephine, I should have been obliged to use it two or three times unless I had used the larger trephine and then should have been obliged to use the chisel in removing the triangular portion of bone left between the openings.

This might have been done well with the bone forceps. This kind of forceps which I hold in my hand allows you to pick up any little spiculæ of bone which may be projecting from the under surface of the bone. The fact that the inner surface of the skull is irregular and uneven makes these little projections very prone to appear.

In using the trephine, you make the incision in the same manner as I have made this one. I think that this is the best incision to make, for it makes a perfect covering for the skull and if you desire to return the fragment of bone it forms a species of support for it. If this operation is done with the trephine it is necessary that you hold it still until a groove is made. This would be a difficult task if it were not for the fact that in each trephine is inserted a center pin which projects from 1-8 to 1-16 of an inch. The point of this pin holds the trephine until the saw is made to hold. As soon as the groove is deep enough to hold the barrel of the trephine, the pin is removed; otherwise it would pass through the skull first and would injure the brain. I do not mean to say that such an accident would be a fatal one by any means. We know that the brain and its membranes may be injured to a considerable degree without any very serious results, but of course we must avoid any unnecessary injury to it. Remember that this circular saw, the trephine, is not applied to a plain surface, and it is impossible to make it break through the inner plate of the skull evenly and at all parts at once without tipping the trephine in all directions. At first there will be but little discharge of blood. When the trephine has passed through the outer table of the skull there will be a considerable amount of hemorrhage calling your attention to the fact that you have reached the diploe. Your anatomical knowledge tells you that the diploe is very cancellous, soft and vascular; therefore the trephine will pass very readily through it and come down upon the inner table of the skull. It is now that the saw must be manipulated very carefully indeed. All the time from the beginning you will carefully measure the distance sawed from time to time, but especially careful will you be in passing the inner plate, that you do not go down suddenly upon the brain. As soon as the button is loosened all around, the probability is that it will come away with the trephine; if it does not, the additional help of the elevator will enable you to lift it out without any difficulty. Then you apply the trephine again in the same way, if the case is an extensive one, embracing the depressed bone between, in this way making the incision as large as is necessary to accomplish your purpose. In all of these cases the large openings are the best. They should be large enough to uncover all portions of the depressed bone which should be elevated. It is well in most instances to replace the fragment of bone. I have replaced fragments of bone an inch long and three-quarters of an inch wide in two instances, with the result of having them grow, with the exception of one of the halves of one. It is an advantage to the patient, of course. There is an opinion among the laity that the openings in these cases are covered by a piece of tin or a piece of silver. This is not done nowadays unless we try to close the opening with the bone button which was removed by the trephine.

ANAESTHESIA.

It has always appeareed to me to be of paramount importance that the surgeon should bear in mind the fact that complete anæsthesia, induced by an agent, chloroform, ether or any combination of these or any other lethal substance, is always, and must always be a dangerous condition for the patient. Death is so near in this state of abolition of consciousness, sensation and motion that it becomes quite easy to believe that, even a "little thing," may divert the balance and precipitate the patient into his arms. I am inclined to the conviction that surgeons generally fall into the habit of giving the administration of an anæsthetic secondary consideration in the items of operative work, familiarity with its use, and long periods of freedom from accident are apt to lead one to forgetfulness of the time expended in an operation or the methods of giving the anæsthetic, intrusted as it is, almost entirely to a second person, during the care and perhaps annoyance of a prolonged operation.

The surgeon who has had a death from the anæsthetic, or one who has come so close as barely to escape, never gives up entirely to any one his watchfulness over his patient's actions under the anæsthetic. A careful vigilance should be maintained by every surgeon over the hazardous condition without reference to comparative suppositions as to the safety of different agents or methods.

The time is within the memory and practice of some of the surgeons still among us, when operations were compulsory without the benefits of anæsthesia and when certainty of action and rapidity of execution was one of the most desirable accomplishments of the surgeon.

After the introduction of anæsthesia the habit of deliberation and absolute slowness seems to be taking the place of haste and even skillful rapidity.

One hears this expression "Time is of no account. operate deliberately and slowly." Is it not well to ask the question "Has not the pendulum swung too far to the side of deliberation?"

It does appear fair to state that time is of great importance to a patient profoundly anæsthetized and, in my opinion, when prolonged beyond an hour, the administration becomes a matter of serious hazard to the patient. So that in operations requiring a longer period of time the agent should be given with greatest care, drops should be begrudged and every known means of resuscitation, support and restoration be ready at hand for use in order that there would be no delay in their use in case of necessity.

It is certainly a pernicious habit, no matter how brought about, or for what reason practiced, to heedlessly prolong an operation, simply because the patient can feel no pain.

It is well known that the vast majority of hospitals in foreign countries adopt chloroform as the agent used to produce anæsthesis. No doubt surgeons in private practice all over these countries use the same agents.

It never fails there, is not disagreeable, is portable and so seldom harmful that they do not ask for anything better.

They do not deny that a patient is occasionally lost by its use, but they say death also comes as the result of the use of ether or any other agent.

They are honest enough to say that perhaps greater care and attention to the details of the administration of the agent and to the condition of the patient to whom it is given would lessen materially the present low death rate. At least, American surgeons cannot teach them that ether is safer than chloroform. For instance, a prominent surgeon from one of the large eastern cities visited a foreign hospital and chided the surgeon in charge for using such a dangerous agent as chloroform, although years of use in daily operating have given him confidence in it. The visitor is politely asked to illustrate how a patient can be safely put to sleep and kept asleep with a moderate amount of ether. The ether is being given with the hospital surgeon quietly waiting to commence his work; he notices some change in the patient which causes him to be anxious and ask the visitor if he is sure everything is all right. The reply is a prompt and assuring affirmative. He still waits and in waiting becomes more anxious, he takes hold of the patient's wrist and finds it pulseless—he insists on discontinuance of the ether in the midst of the reassuring utterances of the visitor. The inhaler is removed and the patient found dead beyond all possibility of reclaimation in spite of prolonged efforts. This was certainly an unfortunate accident to happen under such circumstances, proving the danger of overconfidence here, as elsewhere

Personally, my sympathies are with the use of ether, first, because I have always used it and have been associated with those who have always depended upon ether, second, because I have never witnessed a death during its careful administration. On the contrary, I have seen four patients loose their lives during the administration of chloroform, and with no other cause acting to produce their death.

There is no doubt in my mind that death may result from the administration of ether, but my experience with it makes me bold enough to say that an unfortunate result comes from ether, the bad condition pathologically of the kidneys or the lungs, or from faulty or careless use, or a combination of both.

The danger with ether, principally, is from suffocation, almost invariably the result of carelessness. Usually the suffocation is caused by permitting the closure of the pharynx by the falling back of the tongue or by an accumulation of mucous. The danger of chloroform is from a seeming sudden and absolute paralysis of everything vital which so far appears to be unexplainable aswell as irremediable.

Further, complicated inhalers, however simple be their construction, fail to give any security or ease in administration and after a fair trial have been discarded in my practice for a simple apparatus made fresh for each case out of a towel. They are always clean and hence free from the mouthings and slobberings of many patients, which make the shop inhaler an abomination. They can be had anywhere and allow of most perfect adjustment to the face.

The safest inhaler for chloroform consists of a frame made of wire and covered with thin cloth. This should be placed over the patient's nose and mouth and the chloroform should be poured upon this continuously, drop by drop, in order to secure a uniform amount. The thin cloth will permit the vapor of the chloroform to be thoroughly mixed with air. During the stage of excitement, it is well to remove the chloroform entirely until respiration becomes regular.

PREPARATION OF PATIENT FOR OPERATION.

Before the patient is brought into the amphitheatre, I desire to make a few remarks about the arrangements necessary previous to the performance of any operation, and thus answer the questions asked. During the past six months or more, we have not used any sort of antiseptic fluid as a wash to aseptic wounds. None for any purpose whatever other than a one per cent solution of carbolic acid in water in which to place the instruments. We are perfectly satisfied with thoroughly boiled and thus sterilized water as cleaning material, cheap, efficacious, easily obtained and reliable. We do not believe that antiseptic fluids are harmless in fresh wounds, and do not think their use at all necessary when proper and careful preparation has made the site of the operation surely aseptic, and the similar preparations have placed in the same condition the hands of the operator, those of his assistants and all instruments to be used. We try to impress upon ourselves and upon every one having anything whatever to do with the patient or his surroundings, the fact, that the patient's life is positively endangered by the slightest relaxation of vigilance in maintaining a thorough asepticism in all things.

How is the condition secured? The site of any operation is first thoroughly washed and scrubbed with soap and water. If any hair grows upon the surface have this shaved off. Then it is again washed with soap and water. Secondly—The surface is thoroughly washed and bathed with a solution of mercuric bichloride 1-1000 if near the outlets of the body; 1-2000 anywhere on the general surface. If any natural creases or puckerings exist these must be carefully opened out and cleansed in the same way. After these washings, the surface is sprinkled lightly with iodoform and a large compress of sterilized gauze soaked in a two per cent. solution of carbolic acid in water is bound on the surface, covered with an impervious material such as gutta percha tissue, and left on until one is ready to make the incision. By carefully carrying out these processes the surface of the body at the site of any operative procedure is rendered absolutely aseptic and the danger from infection of any wound through microbes from the surface rendered practically impossible. Absolutely the same procedure in cleaning the hands and arms is carried out by myself and every assistant and nurse, in order to render them aseptic. Particular and special attention being given to the finger nails. During an operation the hands are frequently washed in sterilized water only, if the operation is an aseptic one, if not, in some antiseptic fluid. The clothing of every one about the patient is prevented from carrying septic materials to the wound by having the person enveloped in a clean white muslin gown. The arms should be bare, long sleeves are frequently carriers of all kinds of infectious matter into wounds. The immediate surface surrounding of the point of incision should be covered with dry towels then again covered with towels wet in a two per cent. solution of carbolic acid in water as a means of safety. The instruments are sterilized by being thoroughly scrubbed in soap water, then rubbed dry and then kept in boiling water, to which a tablespoonful of baking soda for every quart has been added to prevent rusting, for one half-hour, after which they are placed in the one per cent. solution of carbolic acid, in which they are kept until used and to which they are returned when out of use during the operation after being washed clean with hot water. All instruments should be so constructed that they can be easily taken apart so that all joints and irregular surfaces may be cleaned.

The only sponges used are pieces of sterilized gauze and this is rendered sterile by subjecting it to prolonged boiling in hot water after which it is kept in tightly stoppered bottles dampened with a two per cent solution of carbolic acid in water, taken out as used and thrown away. When used they are squeezed as dry as hand pressure will make them, Sea sponges are used in abdominal operations and here only because they are more easily managed and accounted for. The ligatures used are either catgut or silk prepared so as to be positively aseptic according to the following method: The silk is boiled in water for one-half hour and then preserved in 5 per cent carbolic acid solution.

If any piece of silk comes in contact with any external object it is discarded or again sterilized by boiling.

The catgut is immersed in sulphuric ether 48 hours in 5 per cent carbolic acid in alcohol 48 hours in 1-1000 bichloride of mercury in strong alcohol for one week, it is then preserved for use in strong alcohol or in equal parts of strong alcohol and oil of juniper.

We use silk and catgut indiscriminately for either of the purposes mentioned when thus prepared, and always cut the ends short. The dressings after the wound is closed as you have frequently seen are always dry, iodoform, iodoform gauze, and borated cotton. No solutions of any kind are ever put into an aseptic wound. The idea being to add in no way to the irritation always produced by the use of the knife and other instruments. If the wound is not much irritated there will not be any greater flow of serum than the absorbents are able to carry away, hence, you seldom see a drainage tube used. If one is necessary the sterilized perforated rubber drain tube answers every purpose. Now if the wound is already septic how will you proceed?

Carry out exactly similar methods as have been already described for an aseptic operation. Then the septic or suppurating surface should be thoroughly irrigated and cleansed with some of the antiseptic fluids recommended for such purposes. For instance, a saturated solution of boric acid in hot water or one teaspoonful of Tr. iodine to a quart of hot water. or a five per cent solution of carbolic acid in water or less strong, or a solution of mercuric bichloride not stronger than 1-3000 in water. The last mentioned is the most popular antiseptic agent and the one most commonly used because it is the most powerfully destructive agent as regards micro-organisms. But, gentlemen, I begin to believe that thoroughly sterilized hot water is as efficacious as any of these and has, I am sure, the advantage of being harmless to the patient. All the others possess some poisonous properties, many of them are dangerous when used in large quantities and to be of any use under the circumstances we are considering, the quantity must be large. If the suppurating surface is large and old, holding a considerable quantity of free pus, this can be all washed away by the water alone. If it is lined by a dense membrane of granulation tissue, the old Pyogenic membrane, I doubt the probability of the strongest and most deadly of antiseptics being able to destroy micro-organisms lodged in it, in fact I sometimes think that the coagulating properties of these fluids are likely to fix the micro-organisms in their breeding places, quieting them for the time but a menace and perhaps a real harm for the future. The best method, in my opinion, is to scrape away with the sharp spoon, as you so frequently see me do, all this unhealthy and septic lining down to the healthy tissue underlying it and then use only the sterilized water for washing. If the scraping is done I am sure the strong antiseptic fluids are harmful. They never should be used about the brain or abdominal cavity. After the septic surface has been treated as suggested, the further operative procedures are executed as already described except that it is very seldom that the wounds are entirely closed by sutures, it is usually best to pack the cavity with iodoform gauze to be left in until loosened by developing granulations. In this way the wound can be kept perfectly aseptic for any length of time, provided the external dressings are changed at proper intervals and the same care practiced at each dressing that was carried out during the primary operation. I am sure if you follow out religiously in every detail the minutest direction now given you, adding to their perfection if you can, in the matter of cleanliness and the avoidance of the entrance of any foreign substance into the wounds made, that you will seldom, if ever, be troubled with suppurating wounds. The wounds you make or treat will heal kindly and rapidly and firmly, without much pain and without abnormal temperature. You have repeatedly seen me make the most extensive wounds, and subject patients to prolonged and severe operations, and I have just as repeatedly shown them to you at the end of a week or two with wounds soundly healed and the patients free from any signs of suffering or exhaustion. So, gentlemen, I have some right to speak confidently about these things and to ask of you confidence in the procedures advocated.

I like to see the rule which I have given you regarding suppurative cases carried out here. This case is not exactly a suppurative case, but I was not quite ready to have it brought into the arena. It is the case you remember that was before you with an extensive suppurative osteomyelitis. We opened it, carefully cleaning out all diseased tissue, and packed the cavity with iodoform gauze. It has done very well. There are no extensive manifestations of inflammation. We will have it dressed outside. Do not operate upon suppurative cases or cases that have been suppurative, until you are through with all of your other cases.

Those of you who have attended our clinics for some time have noticed that we are as careful in arranging the order of our cases for dressings as for operation, never dressing septic wounds until all of the aseptic wounds have been disposed of; not that we consider it impossible to completely disinfect our hands after manipulating septic wounds but because we desire to eliminate every possible source of infection.

A Precise Method of Excision of Clavicle, Scapula and Humerus.*

I am induced to present this case to you this evening both because of the rarity of such cases, and because it affords a very good example of the recovery of the human body from terrible injury. I will at the same time show you the specimen, which displays the disease *in situ*, and the amount of affection there was present.

Before doing this operation, I, unfortunately, had not inquired very carefully into the subject; had not read much about it, and hence, did not know much of the history of the operation, nor the circumstances under which it was adopted. But I have since been enabled to collect a little history of this operation, and will read what I have collected, mainly an abstract from a paper read before a society in Berlin by Professor Adelmann. These cases come to the attention of the surgeon under three circumstances: first, the operation is done for the surgeon by machinery or some accident previous to the patient coming under his charge; second, the surgeon does a series of operations, removing first one part of the member, then another part, and finally a third or fourth part, until the patient dies of recurrence; and third, the primary removal of the entire extremity as soon as the disease is recognized—the heading under which this case will be placed.

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*Read before the Chicago Medical Society, January 21, 1889.

Professor Adelmann addressed the Surgical Society of Berlin, June 4, 1888, concerning the operation for the removal of the upper extremity, together with the scapula and a part or whole of the clavicle. His address contains the history of the operation placing the date of the first reported case at 1808. The operation was next performed, between 1830 and 1840, five times; between 1840 and 1850, five times; during the next decade, three times; during the next, seventeen times; during the next, thirteen times; and since 1880, twenty-six times; making in all *70* reported cases.

He discusses the statistics of Paul Berger, comprising 51 cases, and his method of operation. Adelmann makes three classes: (1) cases in which the operation was performed after traumatism; (2) cases in which the operation was performed for benignant tumors; (3) cases in which the operation was performed for malignant tumors.

In the first class are 14 cases with 9 recoveries; in the second class, 3 cases with 3 recoveries; in the third class, 50 cases with 24 recoveries. This third class is subdivided into *sarcomata*, of which there were 26; *enchondromata*, 7; encephaloid tumors, 4; the remaining number bearing different names in different languages.

Of the 50 cases with malignant tumor, in 25 the entire operation was completed at one sitting, among these 25 cases there were 10 recoveries. Of the 25 cases having more than one operation each, 19 cases were operated in two sittings with 10 recoveries, 4 cases had three operations each with 3 recoveries. Of 2 cases with six operations each 1 recovered. These recoveries apply simply to the operation itself; deaths from recurrence after healing of the wound are not counted in the statistics. Among the 25 cases in which several operations were performed there are 17 in which the arm was primarily removed, but having recurrence it was found necessary to remove the scapula and clavicle. Professor Adelmann remarks that this should induce us in the future to perform the entire operation at once, as these cases were all seen early, and the chances for radical cure must necessarily have been good. As it was, only five of all these 25 cases remained free from recurrence for years after—one after 30 years, one after 20 years, two after 6 years, and one after 3 years.

In the 15 cases of death after one operation, 7 cases were due to the operation or to the low condition of the patient at the time of operation; 2 to shock; 3 to hemorrhage; 1 to gangrene of the flaps; 1 to purulent pleuritis; and 1 to secondary hemorrhage.

In 8 further cases in which the wound was entirely or almost entirely healed, the patient died from recurrence, five times in the lungs, the time of recurrence varying from three years to four months after the operation. In view of the frequent occurrence of secondary tumors in the lungs, the author advises careful examination of this organ, and considers an evidence of the presence of tumors in the lungs as a contra-indication for operation. The percentage of recoveries from this operation for malignant tumor is a little less than 50. Many methods of operation have been adopted by the different operators, but the plan of ligating both the subclavian artery and vein primarily seems to be advisable.

I will show the case as rapidly as possible, in order to let the patient get out of the room. You see the wound is healed, except this one spot of granulations. The boy, from his general appearance, is much healthier and stronger than previous to the operation. You will notice that there are quite a number of little pleats here, as if the sewing had not been very well done; there is apparently a superabundance of flap at the upper part which might have been used to close this gap of ulceration. This resulted because I had not a plan in view before the operation and made my flaps a little too redundant, so that when the lower flap was brought in contact with the upper one its fullness caused the foldings during the apposition.

This case came before the clinic at Rush Medical College; a boy much reduced from pain, displaying merely an enlargement of the upper end of the humerus, implicating the shoulder-joint. The growth surrounded the bone, but was not uniform in development. Manipulation showed seeming fluctuation, both on the anterior and posterior aspect of the tumor, so much so that friends who sent him supposed that to open an abscess would be all that was necessary. But the appearance of the patient and the general aspect of the tumor rendered me suspicious, and, therefore, I introduced an exploring needle; instead of pus, I got only blood. The exploring needle went through the soft tissues to the bone, calling attention to the fact that there was not only implication of the soft part, but also disease of the bone itself. It seemed evident that it was a case of *sarcoma* of the shoulder joint itself, probably commencing in the capsule and passing from it to the tissues around it, and that it would be very likely to recur after amputation, or other simpler operation upon the shoulder-joint. I explained to the father that as it was a malignant tumor, the only thing that seemed to me feasible was the complete removal of the shoulder. He consented to the operation.

From the report I have read, you will understand that the immediate danger of the operation is hæmorrhage. There is another danger—the introduction of air into the veins as they are divided. In all operations about the large vessels of the neck or axillary space, where the veins are apt to be patulous, there is a source of anxiety to the surgeon from this cause. To overcome these immediate dangers, primarily to any incision for amputation, the circulation must be controlled by ligation of the subclavian artery and vein. This vein contains a large mass of blood, and if divided without control of it, much blood is lost, aside from the danger of the introduction of air. Not having seen the reports of Paul Berger's method, I proceeded with this idea in view, and made the first incision above the clavicle, uncovering the subclavian artery, which was ligated close up to the side of the scalenus anticus muscle. The incision was then carried directly over to the top of the shoulder, the same as for amputation at the shoulder-joint. This incision was prolonged to the axillary space and along the line of the axillary border of the scapula. As soon as the axilla was opened, the pectoralis major and minor muscles were divided and the axillary vein was included between two hæmostatic forceps and divided—the main trunks of the brachial plexus were then divided. The arm was then drawn over the front of the body and this incision adopted for excision of the scapula—following the spine of the scapula, so that the posterior flap was divided into two portions. These two flaps were dissected off until the posterior part of the scapula was uncovered; raising it from the chest wall, the muscles were divided and the extremity removed. All bleeding points, together with the axillary vein, were now ligated and the flaps united.

This operation was not made upon any specific plan. Following the suggestion of Mr. May, who, in the last issue of the *Annals of Surgery*, reports two cases of this operation, I have looked through all the books in my library and have not found any specific method given. It remained for Paul Berger to give a plan for it. He was led to the plan he suggests after several trials upon the cadaver. The quickest and easiest method of doing the operation and securing the blood-vessels is according to his plan of procedure. He makes his first incision from the inner extremity of the clavicle outward to the top of the shoulder, immediately uncovers the clavicle and turns it out of the way; this leaves the subclavian vessels exposed so that they are easily secured. You all remember well as a result of past experience that as the front of the axillary space is uncovered there is always to be seen a ridge across it produced by the raising of loose tissue upon the external thoracic nerve. It is easily found, and I call attention to it because passing outwards this nerve leads directly to the interval between the artery and vein, and hence to them. With the clavicle out of the way the vessels are superficially situated, easily isolated and free from diverging branches. The artery should be tied in two places, an inch apart, and divided; and the vein also; then the circulation is absolutely under control. May advises that just before the vein is tied the arm should be elevated for a few minutes to allow the venous blood to drain from it, thus saving as much blood as possible for the patient. In my second case I applied the Esmarch bandage up to the axilla. As soon as the arteries are secured in this position, by a rapid cut with the scissors, the brachial plexus can be divided and the pectoralis major and minor be severed.

The flap portion of the operation is done in this way: Commence at the center of the anterior incision and carry the knife directly across the anterior part of the axilla and inner arm to the lower angle of the scapula; then from the outer edge of the incision, posteriorly, carry the knife behind the joint to the same point; rapidly reflect the posterior flap; then all the muscular attachments should be divided and the extremity removed without any trouble. This gives a perfectly even anterior and posterior flap, coming together easily and nicely, and avoids the unseemly appearance of the anterior part of this wound, which was caused by the too redundant anterior flap.

This operation was done six weeks ago, and after the first few days there was no time when we felt particularly anxious about the patient's recovery. The patient's perfect recovery has been interfered with by an accident, the effect of which you notice, the sloughing of the flaps, leaving this ulcer. In dissecting up the flaps one is compelled to keep close to the surface, diminishing greatly the nourishment of this immense piece of skin. The danger is increased if the post-scapular artery is wounded; so it is necessary to bear in mind the direction of these incisions in order to secure as neat a stump as possible.

Prof. Adelmann goes on to show that an artificial extremity can be applied in these cases, which overcomes the lack of symmetry, and which can also be made quite useful.

The second case came in about two weeks after this first, demonstrating the assertion that all cases come in couples. A man 37 years old came in one afternoon, with a tumor on the top of his shoulder, occupying the situation of the supraspinous fossa. It had all the indications, so far as external appearances, of a fatty tumor. A surgeon in charge of a clinic labors under this disadvantage in all his cases; he has no opportunity for previous examinations, and hence is apt to go into a case without as complete an examination as it is entitled to. This tumor was examined hastily and the history hastily passed over, and the suggestion made that, in all probability, it was not a fatty tumor but, from the rapidity of its growth, would prove to be malignant, and that it was connected with the superficial tissues of the spinous fossa. As soon as the incision was made and it was exposed we saw the mistake. It proved to be a tumor that grew primarily from the shoulder-joint, and particularly from some part of the capsular ligament, crowding out from beneath the supra-spinous fossa and developing as large as a cocoa-nut upon the man's shoulder. The man had not consented to so radical an operation as entire ablation of the upper extremity, so only a temporizing operation was done; the removal of the tumor so far as external manifestations were concerned. He afterward had the nature of the growth explained to him and, after consulting with his friends, decided, in about three weeks, to submit to the operation. It was done; but he died fifty-six hours after the operation. He was slightly shocked by the operation, but recovered from that and for twenty-four hours was quite well, with only a slight elevation of temperature and pulse; he was then taken with delirium and died in a comatose condition.

I do not know exactly what was the cause of death, but I am inclined to think that it was poor policy to do this severe operation as soon after the primary interference. The man was still depressed and in great fear of the severity of the second operation. All these facts were against him. In this case the operation, after the method I have described as advocated by Paul Berger, I am sure was more quickly done, and with more satisfaction to the operator and, if he had lived, to the patient.

This second case properly comes under the head of secondary operations.

It is quite noticeable from the report read that the cases done by machinery are all reported as recovering, and it is questionable whether they have a place at all in the classification of this operation; because the deaths after such accident are not reported at all.

AMPUTATION OF LEG FOR GANGRENE DUE TO TRAUMATISM.

This young man came into the hospital last night. His foot was injured five weeks ago by compression in a hay press. Both the direct and return circulation were cut off, and as a result of this the parts have dried up and we have dry gangrene. In most cases gangrene comes on as a result or failure of return circulation. In this case the entire nutrition to the part is shut off. It has destroyed the tissues and ligaments of the heel. Infection has taken place since the occurrence of the injury and we have a septic ankle joint, and I propose to amputate above it. I do this because the tissues of the ankle are destroyed as well as those of the heel, and to secure healthy flaps it is necessary to go above them. The Syml amputation removes the foot by a section through the leg just above the tips of the malleoli, a flap being made from the tissues of the heel. It is impossible to do this operation in this case, and as the young man is in a septic condition I am sure that his chances are better to make the amputation above the ankle. If he were in a condition to improve I should wait with the hope of being able to do the Syml operation. In doing this I shall make the skin flaps anterior and posterior from without inward, dissecting these up a little beyond the angle of the flaps, and then make a circular incision through the muscles. You will remember the rules I have given you regarding the flaps. They need not be repeated here. With this flap you take up the skin and facia; the sweeps of the knife should be transversely to the limb and not obliquely, because if the knife is held parallel with the skin it is likely to cause a splitting of the vessels. Now the flaps have been formed, I retract them freely, so as to make the division of the bone a little above. I reflect the muscles and periosteum to a point a little above the prospective line of division of the bone. I then introduce this retractor made of gauze, so as to protect the muscles from the saw. Make the furrow with the heel of the saw and saw the smaller bone first. Then feeling for any irregularities on the ends of the bone, these are removed by means of bone forceps. Be careful when you pick up a blood vessel to pick up the nerve accompanying it and dissect it back and divide it so that there will be no danger of tying it in the ligature. Tie the ligature by passing the thumbs down close to the vessel, then tie as tightly as you can without breaking the ligature or cutting through the walls of the vessel. In order to prevent the sharp edge of the tibia from burying itself into the tissues of the anterior flap and producing an ulceration, I usually saw it off obliquely so that there is no sharpened edge of bone to irritate the skin. It is best to hold sponges to the surface of the wound and remove them gradually as you take up the blood vessels after loosening the Esmarch constrictor. Usually you are not likely to have any bleeding if the main vessels have been tied before the Esmarch constrictor is removed. Here is a little bleeding from a small vessel running down on the inner side of the fibula, or a smaller one running down along the tendo-achillis. The flaps will be brought into position and will be united by silk sutures. You notice that this wound has not been washed, and as a result of this there will be but a small amount of serous discharge, consequently it will not be necessary to employ a drainage tube; but irritating the surfaces with antiseptic solutions will give rise to exudation of serum in considerable quantities and you will have to use a drainage tube, A large dressing of iodoform gauze and aseptic cotton will be applied and held in position by a carefully applied roller bandage. The pressure made upon the flaps in this manner will be gentle and uniform and will keep the surfaces in perfect apposition. The limb will be kept in an elevated position for a few days in order to prevent congestion or œdema.

AMPUTATION FOR TUBERCULAR ANKLE.

Duncan, Mc. 425 S. Western Ave., age 24, American, clerk.

Here is a man with a diseased ankle. It has been a source of great trouble to him for a great many years, and he comes with the request that the foot be amputated. He says that there is no use for me to operate on it and remove the dead bone and diseased tissue, and try to make a good foot out of it. He further says that unless the amputation is made that he will have nothing done to it, because he has had much sad experience with conservative treatment. We will accommodate him by removing the foot. You see that the foot is smaller than the normal one on the other side, and it has been diseased so long that he may be right in his opinion. And now that I come to examine it more closely, I am inclined to believe that he is right as to what should be done, for I think this could not be made to answer the purpose so well as an artificial limb. In children the repair in these cases is much more rapid and complete, and the conservative operation should be done. The patient came accompanied by the artificial limb maker. They had concluded between them as to the place at which the limb should be amputated. It is a rule among artificial limb makers that a stump six inches long is the best to which to attach an artificial limb. Consequently the patient and his friend had fixed upon the length of the stump, and so we shall accommodate them again by amputating the limb according to their wishes. The assistant has a very important duty to attend to, and that is the holding of the limb firmly. When you use the Esmarch constrictor it does not matter which flap you make first. Ordinarily it is best to make the posterior flap first to prevent its site from becoming obscured by blood, but as we have secured a bloodless condition, I shall make the anterior flap first. I shall make the old fashioned skin flap. This limb is full of varicose veins which will have to be ligated just the same as arteries for they will bleed very freely. I find here along the line of the vessels what is often the case in tissues which have been inflamed for a long time. The vessels are agglutinated so that it is almost impossible to separate them. There is not a particle of skin too much on this stump. The flaps are all the better for being long and loose. The skin will contract and make a perfectly smooth surface.

It is very important not to have any tension upon the flaps, in order to secure primary union throughout. The periosteum is retracted for a distance of about an inch, so that the sawed end of the bone can be covered. This prevents the end of the bone from adhering to the skin, which makes the end of the stump much less tender, and less likely to become irritated.

The sharp point formed by the spine of the tibia is removed before the periosteum is drawn down over the end of the bone. We will ligate the anterior and posterior tibial, and the peroneal arteries, and the internal and external saphenous veins and their enlarged branches. The posterior tibial nerve is now drawn down and resected to the extent of about two inches in order to prevent the formation of amputation neuroma.

We will unite the flap throughout. Drainage is not necessary for this wound, because every precaution has been taken to prevent infection and the tissues have not been irritated by the use of antiseptic fluids. The application of the ordinary dressing of iodoform gauze and absorbent cotton, and the fixation of the stump by means of a posterior splint will complete the operation.

Amputation of Leg for Tuberculosis of the Ankle.

Mrs. H., Benton Harbor, Mich., age 45, American, housewife.

This is the patient whose foot we amputated a week ago to-day. It has not been dressed since the operation. There has been no rise of temperature at all and we naturally expect to find the wound in a good condition. This is a peculiar case in that it is the first one that I have seen in which there was absolutely no arterial bleeding from the stump after an amputation. I have seen bleeding that was very small in amount, as in the old lady's limb after the amputation for senile gangrene some time ago. There was but little hæmorrhage in that case, but there was a little. In this case there was none whatever. Perhaps there is but one explanation for it in this case, and that is that the limb has not been used for years and years. There is a general atrophy of the limb and the arteries are diminished in size, so that the blood just flowed through them as it does through capillaries. This condition of affairs being present, you would suppose that there would have been some interference in the nutrition of the stump. Yet there has been no rise in temperature whatever. There is a partial ankylosis of the knee-joint, as you remember, which prevented our elevating the stump in any way. The stump is not in as good condition as I expected to find it. Here is a little spot along the margin which has not healed. This is probably due to pressure from the dressing rather than from infection. There is a little necrotic condition of the cuticle, the epidermic layer, which does not extend entirely through the integument. To avoid pressure upon the tissues and to prevent infection we will have applied to the stump a fomentation of 2½ per cent. carbolic acid, rather than the dry dressing. It will be more grateful to the patient and at the same time will correct the disposition toward the destruction of tissue. You notice that I have washed it freely with alcohol, instead of water. The alcohol is an antiseptic in itself and it is a little stimulating. Any washing that is done on the surface of the wound is done with alcohol. The stump looks well in every part except at this one spot.

The drainage tubes are no longer doing any good and we will leave them out. The openings made by them will remain open long enough to allow the escape of any fluid which may remain between the flaps.

Amputation for Tubercular Knee-Joint.

Gentlemen: The first patient that I show you to-day is a child with an old tubercular trouble of the knee-joint for which a resection was done some time ago. But the disease was not arrested by the operation and the only thing left for us to do in order to eradicate the disease is to amputate through the thigh. This brings up, therefore, the subject of amputations. Amputations are done both for injury and disease. Oftentimes it becomes necessary for the purpose of staying the progress of the disease to amputate above the diseased portion in the healthy tissues, as in this case. The progress of the disease is so positive and of such a malignant character that we must interrupt it by removing the seat of trouble by means of amputating in healthy tissues.

When you come to examine the case of an injury there should be no hesitancy as to what you should do. If the injury is confined to the bone and the large blood vessels and nerves are uninjured, no matter how serious the injury to the bone may be, under no circumstances are you justified in performing an amputation. If the circulation is good below the injury, as ascertained by the pulsations in the larger arteries and the color of the skin there will be no doubt about your ability to save the limb if the tissues are maintained in an aseptic condition. But on the other hand, if the larger vessels are destroyed the amputation will be necessary. After you have concluded that an amputation is necessary, then you will need certain instruments which must be carefully prepared according to the methods I described to you at the beginning of this college year. You will need a good heavy scalpel, a catlin (this small size will do very well in this case), this saw, or a butcher's saw, and bone forceps. Usually there are spiculæ of bone present after the section, which must be bitten off by bone forceps. You will also need a half dozen or more of these hæmostatic forceps for stopping hæmorrhage. Besides these forceps you will need a pair of dissecting forceps to enable you to pick up and dissect tissues. Then you must have catgut or silk ligatures and sutures. The catgut thoroughly sterilized is perhaps best and we generally use it. When all of these instruments, the limb, yourself and assistants have been made aseptic you are ready to begin the operation. You will first make the limb bloodless by elevating it a few minutes and allowing the blood to flow back into the body; you maintain the limb in this condition by means of the elastic band fastened high up about the thigh. You decide upon the kind of operation—whether you make flaps by transfixion, partially skin flaps and partially muscular, or whether you make the circular amputation.

In the circular method the stump will be covered only by the skin and superficial fascia, these being divided by a circular sweep of the knife, dissected up, reflected back, and the muscles divided by a similar circular sweep of the knife to the bone.

If you amputate by the method in which the flaps are partially skin and partially muscular—by the way, I think this is the better method—you choose the seat for the section of the bone, seize the limb between your thumb and fingers and estimate the length of the flaps, which, of course, should be a little longer than half the diameter of the limb, so as to provide for the retraction of the integument. The skin flap is made first by an oval incision through the skin and superficial fascia down upon the muscle. It is then seized with the fingers and dissected up the desired distance. During this part of the operation you will always be very careful to hold the knife squarely across the tissues of the limb. If the knife is held parallel with the skin it is likely to plit some of the vessels, which will give rise to troublesome bleeding. It makes no difference whether you make the anterior or posterior flap first. The anterior flap is made a little longer than the posterior one in order that the scar shall be drawn a little behind the stump, thus avoiding pressure upon it by the artificial limb to be worn. As soon as these superficial flaps are made, a circular incision is made down through the muscular tissues to the bone. In a thigh of this kind I should not think for a moment of trying to amputate by the transfixion method, but would make the flaps through the muscles to the bone in the same way that the flaps of the integument are made. You see the assistant making the incision straight down the muscle in the manner that I have indicated. Always remember to guard the direction of the knife as suggested. The knife is nothing but a microscopical saw and it is designed to make the incision with a free sweep of the knife. As soon as the bone is reached, the entire mass, together with the periosteum, is retracted to a distance that will allow the section of the bone to be made a little higher than the base of the flaps. Then the flaps are brought down over the bone, representing an inverted cone with the base at the integument and the apex at the junction of the flaps.

Before sawing the bone, place a piece of gauze around it and press the soft parts back out of the way of the saw. When you saw, stand directly over the work. As soon as the section is made you search for the blood-vessels. Finding the femoral artery first, you separate it from the surrounding connective tissue a little, so that the walls of the artery are all that will be contained in the bight of the ligature. The femoral vein is next tied in a similar manner. Usually you will be able to find the other vessels and ligate them. We will use the silk ligature for tying the artery. If you are sure the cat-gut is aseptic it answers just as well, and you will not have the subsequent bother of an abcess and the discharge of the thread through a sinus as is so frequently the case when silk is used. The assistant did not follow the directions exactly, and he has what might be termed the oval flap. This flap, however, is a very good one and will answer every purpose. Taking the constricting band off, and removing the gauze, the bleeding vessels are caught with forceps and ligated. I know that the assistant has secured the femoral artery in this case, for I can see it pulsating. I think it is well at this stage of the operation to wait a little and be sure that all the vessels are caught and ligatures applied, whether the vessels spurt or not. As soon as the bleeding has been controlled by the application of ligatures you are ready to close the wound with sutures. You may adopt one of two methods: you may close it by a series of deep cat-gut sutures, sewing the periosteum and fascia near the bone, then the muscles and tissues a little away from the bone, then the deep fascia, and finally the integumental surface. In this way you have the surfaces of the tissues brought closely and firmly into apposition, and you avoid using the drainage tube, which is a disadvantage in any wound, because it leaves a fistula for a time at least. In closing the wound you must be very careful not to include the artery nor to prick it with the needle. You see that this child has not lost an ounce of blood in the operation.

The time was when an operator was supposed to be able to amputate a limb in three minutes. This was before the day of antiseptic surgery, and also before anæsthetics were used. The idea was to do the operation without shock by rapidity of action. In this day of anæsthetics time is not of any consequence in comparison to the suggestions which I have mentioned to you in getting a good stump. If you are not in a hurry in doing an operation the probability is that you will do a good one. This limb should heal by first intention. There is scarcely any irritation, and the temperature will perhaps not reach 101 degrees F., and this will be because there has not been any septic material introduced into the wound. If there has been any septic material introduced into the wound there will be pain in the stump, and a new dressing will be required in a day or two. If not septic, the dressings will not be changed for a week or ten days. Then, as you see, it is well to try to do the aseptic operation by prophylactic preparations of yourself, your instruments, the patient and your assistants in avoiding the introduction of septic material into the wound. If you do this, the worst of operations may be done without resulting in much pain or discomfort to the patient. When you use the continuous suture, I think it is well, after you have gone over the entire surface, to begin again and go over the surface, introducing interrupted sutures between the continuous sutures, so that if the latter give way the former will hold the flaps in position. When the flaps are separated for any reason, the healing will be by granulation.

The ordinary dressing of iodoform over the surface, loose iodoform gauze and borated cotton will be applied extending well up on the buttocks. A bandage will be carried up to the waist to secure the dressings, and the thigh will be kept in the flexed position. The child will be comfortable with the thigh in this position. It will interfere in a degree with the direct flow of blood in the femoral artery of the stump, and it also assists the return circulation. Elevation should always be practiced for this reason.

AMPUTATION OF THIGH FOR CHARCOT'S KNEE.

J. C. H., Stonington, Ill., age, 48, American, farmer. Family history good, patient well until he entered the army at the age of twenty.

This patient has had slowly but constantly increasing symptoms of locomotor ataxia, probably caused by exposure during three years service in the war.

But he appears before us to-day for relief from disabling disease of the right knee-joint, which you can plainly see is very much enlarged and misshapen. Fourteen months ago he first noticed an unusual snapping and grinding in the knee during motion. The knee and the leg below, as far as the ankle became swollen. The swelling of the leg gradually subsided, but the knee remained swollen and its distortion gradually increased, until now an examination shows it to be completely disorganized, movable in all directions, the ligaments apparently destroyed and every motion made in it accompanied with harsh, rough grating. It is also filled with fluid, which upon aspiration is shown to be reddish serum. He has had amazingly little pain in the joint itself, when one considers the amount of apparent destructive change that has taken place. Yet he has complained, and does complain, of severe shooting pain throughout the leg, and especially in the upper third of the tibia, which you can plainly notice is much enlarged. The shooting pains spoken of are common to, and characteristic of this general disease, for I take this to be clearly a case of Charcot's disease of the joint, a condition not infrequently present as a complication of tabes dorsalis. It is so named because Professor Charcot, of Paris, was the first one to thoroughly describe it. The most noticeable peculiarity about the disease is well illustrated in this case, in which the most destructive changes have taken place without correspondingly severe manifestations of their progress.

Believing the patient will be best relieved of his trouble by an amputation of the thigh through the middle, we will proceed to do that operation.

The limb was removed by forming the ordinary long anterior and short posterior flaps by transfixion. No antiseptic fluids or washes of any kind were used on the stump; it was dressed with dry dressing, iodoform, iodoform gauze and borated cotton. The thigh had been rendered thoroughly aseptic before the operation.

The joint was opened and displayed to the class; it displayed the characteristic appearance of a Charcot's joint—the fluid was sanguineous, the articular ends of the bones enlarged, that of the tibia being worn off as by a grindstone. The ground surface showed extreme hardening.

AMPUTATION AT THE HIP-JOINT.

You have seen this patient before. We removed the limb at the hip-joint a month ago and the patient went on to complete recovery from the first. We have a perfectly healed wound, with the exception of this little point of granulation which would not be there had it not been for the fact the the upper edge of the flap was a little prominent and pressed against the dressing, which gave rise to decubitis. You will always have gangrene if any part of the flap is subjected to undue pressure. Even the weight of the dressing is sufficient to cause death in the superficial layer of the skin over a prominent portion of the wound, and if a slight gangrene thus takes place, it delays the healing process, of course.

You remember that this patient has done a great deal for the benefit of surgical instruction. When first I saw her, she was quite a young girl with a tumor as large as a hen's egg in the popliteal space, which I examined. Aspiration showed a bloody fluid, and I looked upon the tumor with suspicion, pronouncing it malignant, and advised its early removal. The parents thought the advice rather harsh and took the patient away without an operation. Later, the patient returned with the tumor developed to twelve times its former size. This time it was found to be a sarcoma developed from the sheath of the sciatic nerve, having a connective tissue capsule out of which it could be shelled. We amputated the limb at the middle of the thigh. The patient recovered from the operation and went home well three weeks after the operation. We confirmed the diagnosis of sarcoma by a microscopic examination. Eighteen months afterward, she came back with a well defined, circumscribed, hard tumor on the posterior flap of the thigh. It was a malignant growth and there was nothing to do but to amputate at the hip-joint. This was done in this amphitheatre four weeks ago and the patient is before you to-day to show you the success attending the operation.

Knowing that the tumor grew from the sciatic nerve, I took the pains to fix the nerve, dissect it up, and cut it as near the sacral foramena as possible. This is the ninth hip amputation that you have had before you, only one of the nine was primarily fatal, and that case not from hemorrhage. And I should be ashamed if any one of you who, having absolute control of the patient, should allow him to die from hemorrhage in such an operation, if he had not previously lost much blood from accident, for you have been taught how to control the hemorrhage completely. This can be done as successfully as in the lower part of the thigh by carrying a large elastic rubber drainage tube over the tuberosity of the ischimn, over the anterior superior spine of the ilium, over a roller bandage 2 inches long and 1½ inches in diameter placed directly upon the femoral artery, then extending over the crest of the ilium where it meets the other end of the tube. This tube is tied and then stretched up along the side of the body by an assistant, and the roller bandage is held in place by another assistant.

We now make the flaps and saw off the femur several inches below the great trochanter.

The large vessels are now caught and ligated; then the bandage compressing the femoral vessels lifted by the assistant, and any bleeding points are caught and ligated. This done the constrictor is removed entirely and the slight amount of hemorrhage which follows is controlled.

In order to remove the remainder of the bone a large individual incision is made over the great trochanter, and then the head is disarticulated without difficulty and without causing any hemorrhage.

It is, of course, necessary to place the rubber constrictor and the roller bandage which compresses the vessels in the hands of reliable assistants.

CHOPART'S AMPUTATION.

John; Chicago; age 40, American, printer.

This is the man who had a double Chopart's amputation for gangrene following frost bite. I must say that this Chopart's operation finds no favor with me. I have been called upon a number of times to amputate the foot after this method. There is almost always some difficulty with the stump. In some the stump, has not healed at all. The condition is frequently such that you are not able to leave flap enough to prevent tension on the stump. and unless this can be done the Syme operation had better be done, or better, the amputation of the lower third of the leg. Then with the aid of an artificial limb the patient will have no more trouble.

This man has the remains of a slough resulting from his decubitus in his long confinement during the process of healing. You should always remember this effect of pressure. This sloughing is not an unfrequent occurrence unless you prevent the pressure. The diseased condition is likely to extend into the bone.

This patient has not been able to be on his feet since the operation, which was performed a year and a half ago. He does not yet consent to an amputation at a higher point on the limb. I am satisfied that nothing short of that will absolutely relieve him. He desires to have these sinuses healed. They lead down to carious bone. It will therefore be necessary to open down upon the dead bone and remove it.

We make the incision along the course of the sinus to the bone, elevate the soft parts from the bone as I am doing by means of the periostom. We will remove all of the carious bone, and will take off quite a piece of bone to prevent tension from the cicatricial tissue. I am confident that this will not cure the man. If not, he will be willing next time to try something better. We will cut out the entire track of the sinus which leads down to the denuded bone. These cavities will be thoroughly scrubbed and packed with iodoform gauze, secondary sutures will be applied which will be tied after removing the gauze packing four or five days from now.

Contusion of Back.

A., 282 Fifth Ave., age 26, American, farmer.

About two weeks ago this gentleman fell about nineteen feet, striking on his shoulders. He struck on some planks, and there seems to be great trouble in the lumbar region. Of course this is a sprain of the back; it may be a stretching of fibres or a tearing of the sheaths of the muscles. If it were the latter, there would be extravasation of blood and a discoloration of the skin, ecchymosis, would be manifest. There is nothing of the kind present in this case. I imagine that there has been some concussion of the spinal chord, and if that be true he will complain of pain from the nerves that are given off from that point. In answer to my question he now tells me that he does have pain in the leg; this goes to prove the fact that there has been some injury to the cord.

TREATMENT: The best thing that we can do for him is to apply a plaster-of-Paris jacket and in this way take the strain from the muscles and secure permanent rest for the parts.

INJURY TO SPINE.

Ruby; Welton, Iowa, age 5, American. Family history and previous history good.

This little patient fell from a baby carriage about a year ago. The mother noticed that the child was a little round shouldered, but did not notice the prominence of the spine in the region of the third dorsal vertebra until within the last few weeks. The child complains of pain in the chest. You notice the marked antero-posterior curvature of the spine, and the accompanying attitude taken by the child. A plumb line let fall from the third dorsal vertebra would pass behind the buttock. There are marked compensatory curves forward in the cervical and lower in the dorsal regions to make up for this abrupt curve backward in the upper dorsal region. There is undoubtedly a softening of the body, of the third dorsal vertebrae. Not infrequently, tuberculosis of the bodies of vertebra—Pott's disease—follows an injury similar to the one this patient has sustained, but in the absence of a tubercular family history and in the presence of such excellent general health the condition present must be attributed to the injury itself and not to a supervening tuberculosis.

You can readily understand why the pain is in the chest; the curve is so high in the dorsal region. The cervical region is not implicated, excepting in the normal compensatory curve, and the curvature of the spine in the dorsal region is not low enough to interfere with the abdomen. A cast in this case would be of very little service, except as a support. The child looks so well that

I am inclined to believe that if she were put to bed for a year or six months the disease would come to an end, as it is not particularly active now, and nature seems to have begun to establish some fixation of the joints. Butter, cream, milk and cod liver oil should be given in as large quantities as the child can tolerate. In that way there will be an end to the disease in the bodies of the vertebrae. It is a case that will improve rapidly, but there will be a permanent deformity. There is no means with which we are acquainted by which the deformity can be restored.

POTT'S DISEASE OF THE SPINE.

Arthur; Kensington, Ill., age 2½ years, American.

Watch this little fellow walk; see how he holds his head. The head is held back in this peculiar position in order to get in a line with the vertebral column. You have noticed the peculiar prominence found in the dorsal region and see that it is due to a curvature of the vertebrae backward in that region, very plainly shown. The body of a vertebrae being the seat of a tubercular inflammation has become so much softened that it is no longer able to bear the weight of the body. The approximation of the body of the vertebrae above to that below, cause the displacement and consequent prominence of the spinous process. The little fellow is very well in every other way and gets around much better than the majority of such patients do. I do not know that I can explain this, except that it is due to an effort on the part of nature to cure the disease, and that the defect in the body of the affected vertebrae has been covered by new bone as the disease has progressed. Owing to the fact that the child has so little difficulty in getting about and that his health otherwise is good, I am not inclined to confine him with a cast or other apparatus. Unless the disease should, later, manifest a disposition to rapidly increase I am inclined to believe that it would not be of any service to him. I should give the child plenty of good food, such as milk and butter, all kinds of fats and ale and beer, if he will take them, and let him run about out of doors.

We have here a disease developed in the bodies of the vertebrae, which is caused, the same as in the lungs, by the bacillus of tuberculosis. The spinal column has become curved posteriorly and the child involuntarily carries its head back on its shoulders in this manner, making a compensatory cervical curve to bring the head in a line with the column. We will advise the treatment already indicated. If there is any kind of change in the spine indicating a rapid degeneration of the vertebrae, then a cast carefully applied may be of advantage. And perhaps an apparatus would be applied with it to carry the weight of the head.

Blanche E., 2928 Honore St., age 7 yrs., American.

You have heard how well this little girl's mother described the symptoms of the case. It is so well marked that I need not go into the minutiae of it, for you have all made a diagnosis before this, but I desire to impress upon you the information that the mother gives. She described the pain in the stomach and extending down upon the hips and groin. Soon after this she noticed that the child had a peculiar walk; it walked as if it were stiff, and it did not have the usual grace of movement. You notice that the child picks the scissors up for me much better than such patients usually do. A little earlier the child would have walked up directly over the scissors and made a ladder of its limbs in both getting down and up. The mother says that this is not the case. You notice the extreme antero-posterior curve of the vertebrae. No doubt the bodies of the vertebrae have softened, become absorbed to the degree which you see, and nature, after eliminating the destroyed bone, has firmly united what remained of the bones into one piece. The child is thus enabled to pick up objects from the floor without using her legs as a ladder. If we examine the skeleton postmortem in cases of tuberculosis, or Pott's disease of the spine we find the diseased part strengthened in the same way that the architect strengthens the arches in buildings.

There is nothing that I can suggest that will relieve this deformity. I am quite sure that the disease is already limited by nature. Frequently, before the disease reaches this stage, there is infection with pus microbes, and we have abscesses formed, such as psoas, lumbar, etc., according to the fascia which restricts it. The patient has worn a plaster-of-Paris jacket, and all the good has been accomplished that is possible from its use. So we will not advise the use of any further apparatus. We will, however, advise the mother to be careful, and prevent, as far as possible, all jarring of the child's body by falls and the like. The remedial agents will be good, wholesome food, as milk with its due portion of cream, and medicines that will enrich the blood—Syrup ofthe iodide of iron, Hypophosphites, and small doses of Cod-liver oil. I think the mistake in giving Cod-liver oil is in giving too much, more than can be assimilated. A teaspoonful three times a day is, as a rule, as much as can be assimilated by a child. It may be given in a wine-glassful of beer, or in combination with the extract of malt. Or if you or your patients have consciencious scruples against using beer, you can give it in the foam of beer. It is best administered an hour after meals.

Lateral Curvature of the Spine.

August K., New Hampton, Iowa, Age 8, American.

(Q.) Well, my boy, are you sick? (A.) No, Sir. (Q.) Did you fall and hurt yourself in this way? (A.) No, Sir. All that the parents noticed in this case was that the two shoulders were not the same in outline. You notice that the boy has very good use of his arms. Will you tell us, please, what the trouble is? (Student.) The right shoulder stands out more prominently than the left. (Q.) As he bends over and I make the course of the spine distinct by irritating the skin over the spinous processes, what do you see? (A.) A lateral curvature to the left. Looking along the spine from the neck to the sacrum, you notice a marked sinuosity of the column. There is a lateral curvature of the spine with the convexity toward the elevated scapula. Often in feeble girls a deviation in the spinal column from the normal is not detected until a dress is being fitted; then it is noticed that one scapula is more prominent, it stands out more from the ribs than the other. In such cases the convexity of the spinal column always points toward the protruding scapula. The scapula appears as though something were growing under it. This is due to the fact that there is an increased curvature in the ribs, and the scapula is carried out by this increased curvature.

(Q.) What would you do for this patient? (A.) I would put him through the list of gymnastic exercises. If faithfully and religiously carried out for one hour a day, in three months the deformity will be corrected. It is not necessary for me to repeat that I believe that all systems of braces or plaster casts are injurious and should not be used in these cases.

I will illustrate this method of treatment by asking the patient to go through the list of exercises formulated by Dr. Bernard Roth so that you may appreciate the different steps. In place of a narrow table it is just as well to use an ordinary ironing board placed on two chairs.

1. Lying on back, arms by the sides of the body, hands supinated, slow. full inspiration by the nose; slow expiration by the mouth (repeated four times).

2. Similar exercise with the arms extended upwards by the sides of the head (repeat four times).

3. Same position as 1, head rotation on axis to right and left alternately; also lateral flexion of the head to right and left alternately (four times).

4. Lying on back, slow simultaneous circumduction of both shoulder joints from before backwards, elbows and wrists extended (twelve times).

5. Same position as 1, hip circumduction both ways slowly, knees kept extended (ten times).

6. Lying on back, simultaneous extension of arms upwards, outwards and downwards from a position with the elbows flexed and close to the trunk (four times).

7. Lying prone; hip-circumduction both ways; knee kept extended (ten times).

8. Sitting on couch with back at an angle of 45°, ankle circumduction down, in, up, out, the toes being directed inwards the whole time (twenty times); abduction (surgeon resisting), (eight times). This may be omitted if there is no tendency to flat-foot.

9. Lying on back, arms extended upwards by the sides of the head, slow flexion of both arms (surgeon resisting by grasping the hands), followed by extension (patient resisting), (six to eight times). The patient's knees flexed over the end of couch or table to fix the trunk.

10. Patient sitting astride a narrow table or chair without back, with arms down and hands supinated, trunk-flexion at the lumbar vertebræ (patient resisting slightly), followed by trunk extension (surgeon resisting by his hands against the back of patients head), (six times.)

11. Patient with arms extended upwards, leans against a vertical post or door fitted with pegs on each side, which he grasps; the surgeon gently pulls the patient's pelvis forward by his hands on the sacrum (patient resisting), and the patient then moves back the pelvis to the post or door (surgeon resisting), (six to eight

times.) At no time are the patient's heels to be raised from the floor. Also pelvis-rotation on its axis to right and left alternately (surgeon resisting with his hands on each side of the pelvis), (six to eight times).

12. Lying on back with head and neck projecting beyond the end of the table, arms by the sides of the body, hands supinated; the head is gently flexed by the surgeon's hand on the occiput (patient resisting), followed by head extension (surgeon resisting), (eight times.)

Spina Bifida

Bessie, Shewanee, Wis., Age 3 months, American.

You have a little patient before you to-day, gentlemen, with a tumor at the lower end of the back, in the middle and about at the base of the sacrum. It is situated over the last lumbar vertebra. The baby is a bright, fat, chubby looking little fellow, apparently healthy in every other respect. Now that the dressing is removed, you see that we have a tumor of a bluish color on the surface, with exceedingly thin walls. It is much broader at its widest part than it is at the base and it contains fluid.

Its walls are made up principally from the sheaths of the spinal cord. The base of the sac is made up of the integment of the body, the tumor is congenital, growing a little larger all the time, and the walls are becoming more attenuated, until they are so that they may rupture at any time. It is a condition which follows a want of developement of the spinal column. The laminae and spinous processes are wanting, allowing the protrusion of the membranes of the cord. Spina bifidae are divided into three varieties: .The meningocele proper, meningo-myelocele and syringo mylocelle cases in which the cystwall is as attenuated as in this patient are always fatal if allowed to remain uncared for. There are different methods of treatment that have been advised; as, for instance, the injection of certain fluids which have for their object the irritation of the walls of the sac and finally an agglutination of the walls and the closing of the opening. There are other methods but all of them are quite unsatisfactory. Of late I have operated upon three different patients suffering from spina bifida with the result of curing two of them absolutely.

During the operation the patient is held in an inverted position in order to prevent the cerebrospinal fluid from escaping too rapidly. This might result in a sudden congestion of the cerebrospinal system and almost instant death. Now I have opened the sac, I purpose now to separate the lining membrane of the sac wall.

You see by a little patience and perseverance I have succeeded in separating all of the lining membrane of the sac entirely free from its walls. This is the protruding membrane of the cord. We will ligate it and thereby close the opening, then we will close the wound with the "stairway" stitches of fine catgut. You are not required to remove very much of the external covering, for you see that we have only enough to bring it firmly together and as it contracts it will strengthen the part. These stitches should be applied so as not to penetrate the external skin. This row of stitches that I am applying now are entirely separate and distinct from the others and are merely for the purpose of closing the external line. You can readily understand now why we did not cut away any of the redundant skin.

I do not see any reason why an operation of this kind should not succeed nor why it is not as reasonable as any similar operation for the removal of a sac about any portion of the brain. In the method of injecting some irritating fluid a plastic exudate is sometimes thrown out and causes an agglutination of the walls, closing in that way the opening. Success has sometimes followed where the opening into the spinal column was very small, and could be shut off at the time of injection by pressure. Where the tumor is pedunculated and the opening is small the spina bifidae may be shut off from the spinal canal by means of the rubber band. It may then be injected. The fluid commonly used is the one introduced for this treatment by Prof. Brainard, viz., iodine. This mode of treatment, however, has gone out of vogue because it failed in most of the cases. In many cases this treatment resulted in an inflammation that could not be controlled. You can readily see how this result might follow. I believe that the thing to do is to attack these troubles decidedly by a procedure similar to that which I have made use of in this case.

So far as our experience is concerned the results are favorable: two cases, as I have said, resulted in absolute cures. The case that died was unfavorable for two reasons. There was a very large opening in the dorsal region that would admit the end of a finger, the laminæ and spinous processes of two vertebræ were wanting. And after tying the ligatures and closing the wound, not satisfied with the security and did a very wrong thing by passing a catgut suture through the base of the tumor to close the opening more securely. I am very sorry that I did this, for the child did very well for a week and then infection took place beginning at the stitch referred to. The wound became inflamed and resulted in a septic meningitis causing the death of the child.

You will approach these cases with a good deal of anxiety as to the results. The parts seem to be more easily infected than other parts of the body and the strictest observance of cleanliness must be maintained. I wish especially to direct your attention to these facts, that you may take all the necessary precautions to prevent infection. Nothing then remains to be done but to apply external dressings of iodoform, iodoform gauze and borated cotton. The great object is to keep the wound absolutely clean. You see that it is in a difficult part of the body to keep clean, yet I think with a great amount of care it can be done.

SPRAINED WRIST.

John S., 2266 Archer Ave., age 30, American, carpenter.

This is quite an interesting case. Four years ago this man lifted a heavy weight and flung it aside producing extreme abduction so that he sprained the ligaments of the wrist on the radial side, disabling him for work for two weeks. He is a carpenter, and when he does any extra amount of work his wrist swells and gives him trouble. The persistency of these troubles gives the origin to the expression, "A sprain is worse than a break." I am satisfied that this has reached a condition where absolute and positive rest is an advantage. I find no line of fracture, and the trouble is principally on the radial side. I will advise the application of a light cast of silicate of sodium for this patient, extending up to the elbow and down to the tips of the fingers, to be left on for two weeks. This will relieve it for this time, but not permanently. For I am sure that the first time he goes to work and uses this arm in heavy work, the pain will return. In such cases as this you will not tell the patient that the joint will get well and be as sound as it was before the injury; it will get better, but it is doubtful if it ever becomes as strong as it was before the injury. Do not promise our patients too much.

ANKYLOSIS OF ELBOW JOINT.

Mrs. W., Clear Lake, Dakota, age 18, American, housewife.

We have in this case a complete bony ankylosis of the elbow-joint at an angle of about 90 degrees. There is not a hair's breadth of movement in it. Six years ago the patient had an attack of scarlet fever, following which was an abscess of the joint which led to this ankylosis. Not infrequently you will have such abscesses following exanthematic diseases, and you must be ready to meet them. I am satisfied that no different result could have been obtained in this case, for the inflammation has been so great that the articular surfaces of the joint were completely destroyed. The ankylosed arm is not so large as the other. Very likely the trouble was an osteomylitis in the lower portion of the humerus by which the epiphysial cartilage from which the bone grew in length was destroyed. Hence this bone grew in length from but one epyphysial cartilage while its fellow grew from two. It looks like a very useful arm.

The patient wishes to know if we can restore the motion, if not, she does not care to have it changed.

By making a resection we might be able to secure motion, but the patient would be running a risk, and therefore, I do not feel like advising her to have the operation performed. It is very likely that I should get a good result, but possibly I might not.

The patient's joint is ankylosed in the best possible position to make the arm useful. She can carry the arm in such a manner that the deformity will not be noticed, consequently operative interference is not indicated by the conditions present.

Oswald, H., 905 Dana Ave., age 41, German, iron worker.

In October last this man received a fall and sustained a partial dislocation of both bones of the fore-arm outward and backward. Making rotation, I find the head of the radius in this position, and the olecranon process in this position, both showing a displacement outward and backward. Internally I can feel the trochlear surface of the humerus. These facts make the diagnosis positive.

The patient is unable to flex the arm to a right angle. In all such cases of ankylosis, it is well to consult the patient as to his occupation. Here is a man whose occupation would be ruined if his arm were ankylosed in the flexed position. But with it extended he is able to carry on his business of blacksmithing. So of course he would rather have the joint in the extended position as it now is than in the usual position of flexion.

Ankylosis of Elbow.

This is the little boy with the bent elbow. We have it at a right angle, and it remains at that point. I thought for a while that it would be well to loosen the tendon of the triceps muscle, but I am inclined to believe that the result in good would not balance the damage of the wound. I am sure the joint will always be stiff. The last time we operated we produced quite an echymosis as you see. There is a slight amount of motion, and it is worth while to anaesthetize the boy and try to make the motion complete. There has been an exudate that has filled the fossa, which makes it a very difficult case to treat. We have now increased the amount of motion as you see. If he gets even that amount of motion it will be a great help. It would be very easy to tear off the tissues if I were to exert much force. I know many of you are sympathizing with me for fear I will. But we have to risk something in surgery or we will not be successful. The mother wants the child to be able to button his collar. You remember that when the boy came to us the arm was in a straight line. He can button his collar now. We will apply the plaster-of-Paris cast and will hold the arm flexed up to this point for a week.

Contusion of Elbow.

This man, about two months ago, was playing with a child, twelve years old, fell on the kitchen floor and struck his elbow, from which time he has had pain upon motion. The elbow is slightly reddened and swollen, and painful on pressure. It is an interesting case; small injuries have bad results frequently. There is no evidence whatever of a fracture or a dislocation. It is merely a concussion resulting in a subacute inflammation of the ligaments limiting the usefulness of his arm. It has been tender, just at the surface which he struck at the time of his fall, ever since.

The treatment should consist in the use of passive motion, daily and hourly. At the same time mild, warm fomentations should be applied over the surface.

Infection may take place through the circulation, either with bacilli of tuberculosis or with pus microbes. In the former case intra-articular injections of a 10 per cent. solution of iodoform in glycerine would be likely to result favorably. In the latter case the joint should be opened and drained freely and dressed with moist antiseptic dressing.

Anchylosis of Shoulder.

Emma E., Warren Ave., age, 38, American, housewife.

Well, madam, of what do you complain? I have some trouble with my shoulder. Can you use your arm? I can use it a little better than I could. About four months ago this lady had an axillary abscess which was evacuated spontaneously. Since that time she has had a good deal of pain on the surface of the scapula. We have a contraction of the tendons resulting from the inflammation, and the arm is bound down to a certain extent by cicatricial tissue which has formed in the axilla.

Treatment—What the patient needs is to have the limb put through these passive movements. I am sure she will regain the use of her arm. I am not sure that her shoulder will be as good as it was before the inflammation, but she will gain a great deal by these motions.

Anchylosis of Jaw after Abscess.

M. G., Hildreth, Ill., age 4½ years, American.

This is a very interesting case. The father tells me that two years ago he noticed a swelling in the region of the temporo-maxillary joint which increased to the size of his fist, broke and evacuated a large quantity of pus at the superior margin of the eye; hence we have a deep seated abscess which burrowed until it came to the surface just above the eye. A secondary abscess followed, broke and emptied itself in this same way. After this second discharge they noticed that the child could only partially open her mouth. The joint is almost completely fixed on one side. We have as a result of the abscesses a partial fixation of the muscles of the jaw, especially the temporal muscle. By placing my fingers on the ramus of the jaw and then moving it, I do not find any bands of cicatricial tissue extending across from one jaw to the other. Consequently the disease must be confined to the articulation itself, or in connection with the muscles. The first thing to do in this case is to anæsthetize the child, and by a series of wedges try to open the mouth. Here we have a myositis resulting in a fixation of the muscle. I have here a wedge-shaped screw—Archimedes' screw—by the use of which I think it will be possible to forcibly separate the jaws. What can we do next if this fails? Perhaps the next thing to do, would be to divide the tissues subcutaneously and keep up passive motion. If this should not succeed, or if there were a complete fixation in the joint we could do a species of osteotomy and make a false joint. This could be done by removing the coronoid process and a portion of the condyloid process, taking away the upper half of the ramus of the jaw. By one or the or another of these means I am sure that the child can be relieved. It is a case, however, that can not be cured at once, but will require a considerable time for its relief. I am inclined to believe that the forcible extension of the jaw will be a satisfactory treatment in the case.

Some of you remember the case of a man whom we cured of an ankylosis by the removal of the upper half of the ramus of the jaw, and who said when he came before you to show the result of the operation, as he put out his tongue, "That is the first time that I have seen my tongue in seventeen years."

PAINFUL CONTRACTION OF MUSCLES OF THE BACK FOLLOWING RHEUMATISM CONNECTED WITH ANCHYLOSIS OF VERTEBRAL JOINTS.

Dr. W. E. P., Elk Creek, Wis., age 34, American, physician.

This patient, a doctor, attributes his trouble to rheumatism, resulting in deformity noticeable in the cervical and upper dorsal vertebrae. He has an antero-posterior curve, that is, the vertebrae are curved abnormally forward. He is able to move his head but very little, especially laterally, without great pain, referred to the muscles rather than to the joints.. He has tingling sensations in the arms. The arms, hands and feet are swollen to some extent. The patient comes to-day for advise as to what is the best thing to do for his relief. I find that not only is there a bending forward of the vertebrae, but there is a peculiar condition of the trapezius muscle extending as far forward, also as the sterno-cleido-mastoid muscle. The muscle in this area is of a board-like hardness. It might seem, at first glance, that the trouble is "Pott's Disease" of the spine. But I am satisfied that it is not of that nature, but it is due to an inflammatory condition of the joints of the vertebrae. Occasionally after a long period of an inflammatory disease of this nature the joints of the vertebrae are absolutely glued together and instead of having seven bones you practically have but one.

We have such a specimen in the museum which will be a very interesting one in connection with this case. There is a little motion here but it is limited by the muscle, just as nature always limits the motion in such cases. Another case of such limitation is seen in fixation of the joint in hip-joint disease. If this were Pott's disease you know the bodies of the vertebrae would be affected. It is the exception in that disease for the hard, compact arch to be affected.

As a result of the softening of the bodies of the affected vertebrae there is invariably a convexity of the spinal column backward at the point of infection. Again, in tuberculosis of the spine you have the other general systemic conditions incident to the disease. This man's appearance argues against tuberculosis, and he tells me that his health has been good with this exception.

And now as to the relief. I have no doubt that he has tried to be about his business as duty called him and the very act of being about has prevented absolute rest and has increased the inflammation. It is necessary to provide for absolute and positive rest. You know how very difficult it is to hold the head quiet. It is impossible to hold it still for half a minute before the photographer's camera without a head rest. Hence this apparent fixation of the muscle by nature. I am satisfied that the patient will be relieved by some apparatus that will take the weight of the head off the inflamed joints. This will relieve the tension of the muscles. I know of nothing that will do this so completely and perfectly as the jury-mast attached to a plaster-of-Paris jacket.

Anchylosis of Hip Due to Trauma.

A. G., 165 Clark St., age 16, American, elevator boy.

Eighteen months ago, this lad was thrown from a buggy and he is now unable to flex his thigh.

Allow me to impress upon you the importance of these little symptoms, whether they are from trauma or disease.

You always have a guide to assist you in diagnosis in the anterior superior spinous process of the ilium. As the boy lies on the table, and I flex the well limb, you notice that there is no motion communicated to the anterior superior spinous process of the ileum. On the other side, I am able to flex the limb but a very slight degree, before you see motion communicated to the spinous process.

The case is evidently one of traumatic synovitis leading to a limitation of motion in the joint, and is a trouble which I am sure we will have difficulty in relieving. Sometimes traumatic synovitis is very difficult to overcome. Consequently you will warn your patient and friends of the danger attending such trouble.

What can be done for this case? The thing to do is to anaesthetize the patient and forcibly break down the adhesions which have formed, then to apply Bucks' extension to keep the joint surfaces separated if possible, and to keep the limb in the extended position. Hot fomentations should be applied for the purpose of allaying the pain. After a week, passive motion should be introduced and practiced daily.

Remember, however, what I have said in regard to the disease when tubercular in character, not to use force to any degree, for fear of starting anew a latent tuberculosis, or giving rise to general tuberculosis by giving the bacilli access to the general circulation through ruptured veins.

FLOATING CARTILAGE IN KNEE JOINT.

S. M., Pleasantville, Ia., Age 28, American, farmer.

Family history and previous history good.

What is your trouble, sir? I have some trouble with my knee. Have you hurt it in any way? It was broken below the knee when I was four years old. Has it troubled you ever since? It has been stiff ever since. Have you hurt it lately? I sprained it five weeks ago. How did you happen to do it? I do not know how it was done. Where were you when it was done? I was walking on sod ground, and suddenly could not move it and fell down. Did you feel any pain when it was done? It happened so suddenly that I cannot remember. Was the ground rough? The ground was pretty smooth. Where does it hurt most? At the front and side. Did you lay up for a few days? I did not lay up. You have heard the history of the case: This man thinks he has sprained his knee. Without any known cause he suddenly became lame about five weeks ago, and the inability to extend the knee has since remained. And now I am unable to straighten it. It is on account of contraction of the flexor muscles of the thigh. Usually continued pressure will straighten the leg. Let your muscles be perfectly relaxed. Here is the possible beginning of tuberculous degeneration. The pain is referred to the inner part of the knee. He gives me the symptoms of a foreign body in the knee, a loose piece of cartilage. A person may be walking along and suddenly become unable to use the knee. After resting a few minutes, making attempts at motion, the function is restored; usually one cannot find these pieces until the patients come across them themselves, then the diagnosis is confirmed. Now there is something in this man's knee, in the neighborhood of the joint, because he keeps the leg in this position. If the patient were anaesthetized it would be straightened without difficulty. I feel that the flexor muscles are tense, and this is the reason the leg is in this position. The thing to do is to put the joint at rest. This treatment will relieve him temporarily at least, no matter what the trouble is. So as a means to the end, we will advise the application of a plaster-of-Paris cast, extending well down on the leg and to the upper third of the thigh. It will be better to anaesthetize him, then the muscles will relax and the cast can be made to fit perfectly in all parts. He will wear the cast four weeks, and I am sure he will not feel any inconvenience from it.

Note.—The cast was applied, and after two days of rest the patient went to his home in Iowa. The limb is in a good position, just sufficiently flexed at the knee to make walking easy. He is to wear the cast for three months, then apply a flannel bandage from the foot up to prevent oedema consequent to removal of the cast.

Traumatic Inflammation of Knee.

B. F., Crown Point, Ind., Age 48, American, traveling salesman.

Three months ago this gentleman was struck on the leg by a bale of hay. This was followed by an inflammation and effusion into the knee joint. The knee has been more swollen and more painful than you see it now. The disposition is that of a confirmed ankylosis of the knee as a result of the traumatic injury. There is a little predisposition to fixation of joints especially if they are wounded in any way. This is almost the first thing that happens after a joint is affected. Nature attempts to put the joint to rest. This patient has a disposition toward permanent flexion of the leg. The landmarks of the knee are gone. The leg is smooth above and at the sides of the patella. I have no doubt that the patient has been rubbing this with various remedies, but unless it is put to rest,the degeneration will become so great that there will be a dislocation of the tibia backward. Treatment: The patient should be anæsthetized and the leg straightened, then a plaster-of-Paris cast should be applied. In straightening the knee you should be very careful for there is a risk in connection with it. Sometimes the elasticity of the parts in the popliteal space is lost. More than one surgeon has ruptured the popliteal artery, and that means amputation of the thigh immediately. All of the tissues have been ruptured from without, inward. When I make these attempts at extension I can readily feel the adhesions giving way. Now if we should unfortunately have ankylosis of the knee the best position that it can be left in is not complete extension, but a slight amount of flexion. It will then be more useful than if it were perfectly straight. Of course, there will be a disposition of the muscles to contract and flex the leg, but the plaster cast will prevent this.

CONTUSION OF KNEE.

John, 65 Gologhe St., Age 29, Canadian, sailor.

Here we have a contusion of the knee joint. I find no particular difficulty with the tissues of the joint. The tissues are elastic; there is no noticeable thickening or hardening. The patella is freely movable. I find nothing abnormal about the joint, except its stiffness. This is due to the tension of the ligamentum patella on the inner side of the condyle. This stiffness is partially due to the tincture of iodine which he has applied over the surface of the joint. There is nothing to be done for the case surgically. I should advise him not to use the iodine, but to use instead something to soothe it, as a hot fomentation of water and alcohol, and to put the limb through its motions after the acute irritation has subsided.

SPRAINED ANKLE.

Fred S., Western Ave., age 38, German, tailor.

Twelve weeks ago, this man fell four feet spraining his ankle. He says he cannot bear his weight upon it. I find that I can put the foot through all of the movements. The patient has kept the foot quiet too long, and has lost confidence in himself. Let me see you walk. Get right up on your foot, it will hold you. You observe that the patient limps, using two crutches. We will take one crutch from him and then the other and you will see that he gets along very well, showing that he had lost confidence in the strength of the limb. He should have massage and a shower bath every night. Put it through complete circumduction and use it. He will then get well in two weeks. You remember that there is a time when rest ceases to be a good and does injury. You will have to learn to recognize such cases from experience. When you are able to put the foot through the motions that I have applied to this man's foot, and find no swelling nor adhesions from an injury occuring so long ago, you may know that rest is no longer likely to benefit the patient.

G. H., Plattville, Wis., age 32, American, photographer.

This young man sprained his foot fourteen years ago.

Not many years ago a noted surgeon of London made a number of post-mortem examinations following injuries of the ankle-joint. The results were something of a revelation to the profession regarding sprains and injuries about the ankle-joint.

It was found that instead of the ligaments being torn from their attachments a little plate of bone was separated from the shaft, these small fragments of bone, that the joint remained for years in this weakened condition.

You notice that the landmarks have not been destroyed, and there is no evidence of infiltration about, nor effusion into the joint. One peculiarity to be seen is that the foot stands out a little to one side of the leg. A line drawn through the center of the foot will run off to one side instead of going through the center of the tibia. The external malleolus stands out a little too prominently. A measurement shows that there has been a separation of the two malleoli from each other. There has been a separation of the bones, therefore, and a tearing of the interosseous ligament which always complicates the injury very much.

Now, the patient is concerned in what will relieve him. He will not be relieved by using the limb in its present position. I should anæsthetize him, bend the foot up to a right angle with the leg and apply a plaster-of-Paris cast, in this way securing elongation of the tendo-Achilis. The reason why the patient cannot walk any better is because the foot has become fixed in the talipes equinus position.

We advise the application of the cast, as I have suggested, and let him wear it a month. The foot will be put through passive motions and be subjected to massage, and to douching with hot and cold water for the purpose of stimulating the weakened joint.

EVERSION OF THE GREAT TOE.

We have a very interesting case of an eversion of the great toe and of the development of a bursa on the head of the metatarsal bone of that toe. This condition is sometimes called *policis valgus*, i. e., an outward deviation of the great toe. This deformity and its relief was first well described by Frank Hamilton, the famous fracture surgeon. His method of treatment is to make a sufficiently large incision along the inner side of the metatarso-phalangeal articulation, to expose the head of the metatarsal bone and remove it. We will proceed to do this. I have done the operation a number of times and have found no difficulty following it. There is also a destruction of the joint in this case, and this is certainly the operation to do in the case. The joint is entirely destroyed; evidently the bursa has broken down after becoming infected. The degenerated tissue looks very much as if it were tuberculous. The great destruction makes it necessary to do a greater operation than is usually required. I shall use the chisel in dividing the bone. Usually the bone is so heavy that it requires a very heavy pair of bone forceps to divide it, and frequently the bone is crushed instead of being divided. At least we shall partially divide it with a chisel and complete it with the forceps. Usually where the joint is not destroyed, as in this case, the wound is perfectly clean, the edges are smooth, and it is a very pretty operation. This is of the nature of a bunion, but is more painful than the ordinary bunion, and is more apt to suppurate. The only means of relief is some operation of this kind. There is a shoe made with a special internal border to which the great toe is fastened by means of a plaster, but this method does not accomplish its object, because there is always a change in the mechanism of the joint. By the method which we have just employed we get a good inner border to the foot. I have treated patients who had the deformity in both feet, and after curing the greater deformity, the relief was so great that they returned to have the less deformity of the other foot treated in the same way.

In this case it will be necessary to resort to thorough disinfection of the wound, and to use drainage in order to prevent sepsis. In cases in which the bursa is not in an inflamed condition, the wound can be entirely closed and expected to heal primarily. It is important to dress the great toe with a pad between it and the next for months in order to insure a correct position permanently.

Old Dislocation of the Elbow.

This little patient on the table comes here with a dislocation of both bones of the arm upward and backward, five months old. The humerus projects forward and causes this prominence on the front of the fore arm at its upper part, by feeling of it, the irregularities can be easily determined. The fore arm being extended the patient has no power of motion in the joints. I told the parents that I could not do anything without a surgical operation, and probably the most I could do would be to bring the fore arm into a position at right angles with the arm. This accident happened about five months ago. This is a long time, and there is always present a large amount of exudation and cicatricial tissue which bind the bones together the more firmly the longer the time since the accident, and the probability is that no force will be of any service. We will make an effort. Now I know that this is an upward and backward dislocation, for when I followed the ulna in an upward direction until I come to the olecranon process, I feel a sudden depression. I know that this is the olecranon process from its shape and from feeling the tendon of the triceps muscle attached to it, and becoming tense with every effort at flexion. When I make supination and pronation I can feel the rotation of the head of the radius in its abnormal position. We had the accident a few days ago of fracturing the humerus in trying to reduce an old dislocation of the shoulder, and I should not be surprised if we had one today. Now I have succeeded in nearly reducing this. I have the radius in position; here is the surface of the condyle, I have no doubt but that the cavity of the coronoid fossa is partially obliterated, and hence the difficulty of slipping the process into it. I am tempted to cut this tendon of the triceps muscle. Of course, if I apply extra force to the forearm in its present position, it would be very easy to break the olecranon process, so we will fix the arm in the position of a right angle by means of a plaster-of-Paris cast.

Here is the internal condyle, and here the outer condyle, and I can rotate the arm without any trouble. The olecranon process stands out midway between the condyles in its normal position. We will apply hot fermentations to the joint to prevent traumatic inflammation.

After two weeks we will begin to make passive motion every day, maintaining the arm in the position of flexion at an angle less than a right angle while at rest. In case the joint should remain permanently stiff this is by far the most fortunate position. It will require great patience and endurance to secure motion in this joint, and even then one cannot make a positively favorable prognosis.

OLD DISLOCATION OF SHOULDER.

Michael B., Danville, Ill., Englishman, wheelwright, age 42.

This patient presents himself with a six weeks old dislocation of the shoulder-joint. It is very seldom that you will see a dislocation as far forward as this. The most common dislocations are those downward into the axilla, and those forward under the coracoid process of the scapula. We have, as well, the subclavicular dislocation in which the head of the bone is thrown to the inner side of the coracoid process and lies beneath the clavicle.

This dislocation has existed six weeks, and has been subjected to several trials at reduction before coming here, so that I do not feel at all certain that I shall succeed in reducing it, and I shall make no very powerful efforts at reducing it. I have told you several times why you must use great care, and abstain from all powerful efforts in the reduction of these old dislocations because of the great liability of adhesions and the subsequent damage to important structures in the axilla. We shall, therefore, use a limited amount of force, and if we do not succeed we will bring the patient in again and make an open operation, and replace the bone.

I can illustrate very nicely in this subject Dugas' test for dislocation of the shoulder. You take the hand of the injured side and carry it to the opposite shoulder, and if the elbow can be made to touch the chest while the arm is in position, there is no dislocation; but if the elbow stands out from the chest, there is a dislocation of the shoulder. This is a very easy test to remember, and it is a very sure one as well. I should feel very bad if I should tear off the bracial vein or artery in loosening these adhesions.

I have succeeded in making a true downward dislocation out of it. It seems as if we should be able now to reduce it, but I am quite sure that we shall not be able to reduce it by manipulation. We shall reduce it at another time by making an incision and exposing the glenoid cavity.

A week later concerning the same, someone says: "It is always the unexpected which happens." This was not true in regard to what happened in this case of the old dislocation of the shoulder last week. You remember that when I brought the patient in, I told you that I should not resort to any prolonged efforts or to severe violence, but, if unable to reduce it by ordinary manipulation, I should resort to an operation. I mentioned the dangers of an old dislocation of six weeks standing, as in this case. The head of the humerus lies so close to the large vessels of the axillary space that adhesions are apt to form increasing very much the likelihood of a rupture of those vessels. We made some manipulations in our attempts at reduction, you remember, by rotation, extension, circumduction and some of the usual movements intended to reduce such dislocations. Following these movements a small tumor began to appear in the axillary space, warning me to cease my manipulative procedure, reserve the patient until the next clinic and replace the bone at the time after uncovering it by an incision. In a few minutes an assistant came in telling me the tumor was increasing in size. I told him to make pressure on the subclavan artery, and we went on with the clinic. When I went out after the clinic, I found a "pure air" tumor, as it is called because of its coming on so rapidly. It filled the entire loose tissue of the axilla to such an extent that the arm was lifted from the side of the chest, consequently it contained an immense amount of fluid. Recognizing the nature of the accident, we made an effort to secure the injured vessel. We knew that the operation would be a difficult one, requiring a large incision and that it would not be safe to clean out the axillary space and search for the rent in the vessel in the usual way, as it would probably be too high up in the space. Accordingly the hemor rhage was suppressed by compressing the subclavin artery against the rib, and the pectoralis major and minor muscles were divided by a free incision. The artery was found to be the axillary torn about its middle and the ends were retracted. The ends of the artery were ligated and salt solution and stimulants injected, but the patient died twenty four hours later from shock.

Now, here is a lesson in this case, and one which will lead you to handle these cases of old dislocations with great care. This accident has befallen almost every surgeon who has tried to reduce such dislocations. I have reduced many old dislocations using more force than I did in this case, resorting to the movements of adduction, extension and rotation without harm. I have always been successful in cases of two months standing and more recent ones, in a few cases of six months duration and have repeatedly failed as have many others. If you will read the histories found in medical literature you will find many cases on record of the tearing of the brachial artery or the axillary vessels, also tearing of all of the tissues down to the bone, in the powerful efforts to reduce the dislocations.

That accident once happened to Prof. Lister. He was so impressed that he decided in his own mind never to resort to manipulation, after a certain length of time, but to make the open incision which would expose the joint and enable him to cut away all of the muscular attachments of the bone, and in this way reduce the dislocation without difficulty. He has pursued this plan in three cases—one single and one double—and the results are very satisfactory. As a deduction from these operations we may say that your manipulations in these cases should be very carefully made, and also very slight in force. If the reduction cannot be made by easy manipulations when the patient is asleep, do not resort to force, but to an open operative procedure.

I am satisfied that the case before you was peculiar in character, and more likely to injury than is usually the case. After the axilla was opened and examined, it was found that a complication existed in the form of a fracture through the greater tuberosity of the humerus. The edges of the fractured bone were rough, containing sharp spiculæ which, no doubt, had been brought in contact with the artery during the attempted reduction, and did the injury.

You will ever be on the alert, therefore, after an attempt at a reduction of an old dislocation. If the tumor appears in the axilla, you will know by its character that it could come from nothing but the rupture of a large vessel. When the accident does occur, then there is but one thing to do, and that is to uncover the axillary space and secure the injured vessel. There is but one incision which will thoroughly and quickly do this, and that is the anterior opening through the pectoralis major and minor muscles.

CONGENITAL DISLOCATION OF THE HIP.

Meta B., 540 Blue Island Ave., Age, 6, American.

This is a congenital dislocation of the hip-joint. Here are the heads of the femora very near the crests of the ilia. They are not in the acetabulum. Perhaps there is no acetabulum. There is a prominent curving forward of the vertabrae in the lumbar region to compensate the dislocation and to bring the line of gravity between the feet. You all notice the prominence formed by the head of the bone in its abnormal position on the dorsal surface of the ilium, a condition present, in upward or backward dislocation of the hip joint. We can reduce them you see without difficulty by simple rotation, but they will not remain in position if any weight comes on them.

The weight of the body is not supported by the acetabulum but by the ligaments of the joint and the surrounding soft tissues. This gives rise to severe lameness, the child becomes exhausted easily when walking and suffers some pain.

All kinds of treatment have been futile. Among other methods of treatment,the child was placed on its back in bed and extension applied, but as soon as the extension was removed, the deformity returned. The child has been under treatment almost ever since its birth.

We purpose to-day to relieve the deformity by fixing the head of the bone in the acetabular cavity. I shall first proceed in the operation in identically the same manner that I should, were I going to resect the upper end of the femur. After the incision is made, the great trochanter exposed and the muscular attachments detached, the acetabular cavity, or what should be that cavity will be examined. The probability is that we shall find no cavity, but in its stead a smooth surface covered with connective tissue. I shall then make an incision along the lower border of the acetabular cavity and with the elevator raise the periosteum. If the cavity is large enough to contain the bone, it will be replaced, if not, the cavity will be enlarged to the proper size by the use of the chisel. The head of the bone will be placed in the acetabular cavity and the flap brought over the head of the bone in this position.

I have now succeeded in getting the head of the bone beneath the anterior surface of the capsule, after having a little difficulty. I am now sewing the remains of the connective tissue which I separated from the bottom of the acetabular cavity to the remnant of tissue around the trochanter major, forming in this way a capsule for the head of the bone.

We will close the wound in different layers so as to approximate the tissues as accurately as possible during the fixation of the limb. We will have Buck's extension applied at once, in just the same manner as we apply it for the treatment of hip-joint disease.

FRACTURES.

Gentlemen:—Today I shall call your attention to the sign of fracture termed *crepitus.* It consists of the sound and the sensation communicated to the examining hand, produced by the rubbing together of the roughened, irregular surfaces of the ends of the broken bone. When clear and unmistakable, it is a definite and pathognomonic sign of fracture. Occasionally, other pathological conditions give rise to sounds resembling it in a degree, hence it is usual to mention them as a warning against possible mistakes. For instance, the soft rubbing sensation communicated to the fingers upon the reduction of the displacements found in separations of the piphyses is said to resemble crepitus; also the cracking sensation and creaking noise caused by the rubbing of tendons in their sheaths, or inflamed joint surfaces when either are roughened by exudations of inflammation, have been mistaken for crepitus. It is scarcely possible that the sensation caused by the presence of emphysema, or air in the cellular tissue, could be mistaken for crepitus; assertions to this effect have been made. Notwithstanding the excellence of this sign as a proof of the solution of continuity in bone, all fractures do not display its presence. An impacted fracture, the variety in which the end of one fragment is driven into and firmly fixed in the end of the other fragment, cannot have crepitus as a sign. Foreign bodies between the ends of the bone prevent the occurrence of crepitus because the broken ends cannot be brought in contact with each other, as when the sharp end of a fragment is driven deeply into muscular tissue, or dense fascia, and cannot be disengaged.

A practical deduction from this last condition is, that one should always be suspicious of the presence of this complication when crepitus is not found as a sign in any fracture unless absence is dependent upon impaction is very evident and demonstrative. Overriding of the fragments. It enables the attendant to warn the patient and friends of the probability of that unhappy complication termed ununited fracture. Whenever the presence of intervening soft tissues between the ends of a fractured bone is suspected from the absence of crepitus, the patient should be anæsthetized and manipulation continued until the roughened ends meet and give the characteristic sign. Allow me to impress upon you,as forcibly as possible,the necessity of special care and acuteness in the elucidation of this as well as all other signs of fracture in cases, in which the injury is in close proximity to a joint. As a rule in such cases, the land marks used as guides to determine misplacements and deformities are rapidly rendered obscure and often entirely obliterated by rapidly occuring swelling and effusion in the loose tissues about joints, so that the evidences so easily obtained in other situations become particularly difficult to determine. In all cases of fracture, the rule is a good one which justifies us in the use of an anæsthetic in clearing up the slightest doubt, if any exist. Every means should be adopted that will enable the surgeon to establish a positive and complete diagnosis of the actual condition present, as a result of the injury.

The next and last on the list of signs which have been given to you as evidence of the existence of fracture, is Ecchymosis; a discoloration of the tissues in and about the neighborhood of the fracture. It is among the last to appear and is dependent upon the effusion of blood into the tissues, the coloring matter from which stains them. It is a common accompaniment of the injuries producing a fracture, sometimes a very prominent one; for not infrequently the discoloration implicates the entire segment or more of an extremity, and the color is so dark that the patient often and sometimes the doctor mistakes it for an evidence of mortification.

In cases in which, notwithstanding every effort is made to determine the existence of a fracture by careful consideration of all the signs mentioned, there still remains a doubt, the late appearance of ecchymosis at the seat of the injury, spreading along the length of the bone injured, is confirmatory evidence of fracture. The blood in such a case comes from the several vessels of the bone itself and has taken some time, several days perhaps, to make its way through the interstices of the deeper tissues to the surface. Under such circumstances, taken in conjunction with other symptoms it may become a reliable sign of fracture.

Now gentlemen, you have before you a sufficiently complete list of the signs of fractures and we have given to each one a due consideration. It is absolutely essential that you become perfectly familiar, automatically familiar, with the whole and each part so that you will involuntarily bring them to mind whenever a fracture comes under your care. Remember that no single sign is at all times indicative of fracture, nor the absence of the most pathognomonic positive evidence of no fracture. The most reliable among them are preternatural mobility and crepitus. Still the testimony of all is the only basis for satisfactory diagnosis.

Some additional remarks must now be made upon the variety of fracture termed epiphysial separation. The signs are similar to those of ordinary fracture with some especial complications and suggestions. It has already been intimated to you that in this injury crepitation is different from what is present in common fracture. The sound and sensation are subdued and soft instead of harsh and grating. As the injury is always in close proximity to a joint the sign resembles those indicative of dislocation very closely. There is this difference, in dislocation the deformity when once overcome remains permanently overcome. There is no disposition to its recurrence when the efforts of reduction have ceased. In separation of the epiphysis, on the other hand, the deformity instantly and constantly recurs as soon as the efforts made to overcome it are discontinued. Epiphysial separation occurs early in life, that is, before ossification of the skeleton is complete, hence the age of the patient is an important item in the diagnosis. The accident occurs oftenest, perhaps, between the ages of five and sixteen. Another item to be remembered and of significant importance is the situation of the fracture—its close proximity to the joint being dependent upon the normal site of the epiphysial line. The points to be remembered as indicating the presence of an epiphysial separation are, first, the special kind of crepitation; second, its resemblance to a dislocation; third, the situation of the injury; fourth, the age of the patient.

Having finished the description of the signs indicative of the occurrence of fractures, we now proceed to the consideration of the general treatment.

There are two general indications which must be carried out in the treatment of all fractures and these are expressed accurately by the two words *Replace* and *Retain.*

The first, *replace*, means to overcome all deformity by manipulating the ends into such position as will make that position absolutely normal or as near the natural condition as it is possible to bring them. In common language it means to "set" the fracture. Whether the fracture is "set" or not is always an item of anxiety to the patient and the patient's friends. It is almost the first of their questions that the attendant will be called upon to answer satisfactorily. To relieve this anxiety and because of the quieting influence upon both which follows a satisfactory answer to the question, it is always best to give the answer at the earliest possible moment.

Naturally the best time at which to replace or "set" a fracture is just as soon as possible after the accident occurs. For the reason already given and as well because the parts are less distorted by swelling and effusion so that irregularities in position or direction can be more readily detected and corrected, because the element of muscular spasm or contraction is at a minimum and hence offers less resistance to the efforts at reduction because the depressed condition of the patient assists replacement by eliminating in a degree voluntary movements on the patient's part, finally because an early restoration of the broken fragments to as nearly a normal condition as possible has a great influence in diminishing subsequent irritation, consequent pain as well as local and general disturbance.

Fractures are replaced or "set" by means of extension and counter extension, by manipulation, and by position. By extension and counter-extension is meant the application of force in the longitudinal axis of the broken bone, and in directions away from the site of the fracture. The counter extension may be weight of the patient's body, still it is usually furnished by an assistant holding the upper fragment firmly and securely, or, as well, drawing it towards the trunk.

Extension is made by force applied in the same axis to the lower fragment drawing it away from the trunk. The amount of force applied is in proportion to the strength of the opposing muscular contraction, its object is to overcome entirely, if possible, the deformity of shortening. This means of replacement is mainly applicable to injuries of the long bones, or in fractures of the spinal column.

The application of the force in the use of this method should always be regular, even and moderate. By steady, continous extension and counter extension muscular contraction is often entirely overcome and fragments fall readily into proper position. The time during which it must be kept up before accomplishing the object for which it is practised, varies of course with the power of the muscles which are to be overcome and the degree of irritation resulting from the local damage and caused by sharp ends of the fragments.

Manipulation means the use of the surgeon's fingers at the site of the fracture for the purpose of correcting lateral and angular displacement after shortening is overcome by the means already mentioned. The fragments are moulded into accurate position. The hands in this way being enabled to detect all deviations abnormal in character and to correct them. While practicing these means of replacement the surgeon is made familiar with all the peculiarities of the fracture such as the degree of displacement. The condition and position of the fragments, the direction of the fracture in relation to the bone's axis, the special tendency to displacement and the character of the force necessary to be applied in maintaining a proper position during repair.

The application of position as an aid in the replacement of fractures is often necessary and the assistance to be obtained by its use should always be borne in mind. In some fractures in which a powerful muscle lies behind the broken bone and in which the tendency of displacement is always forward and in a marked degree, extension and counter extension, however possible, has no influence towards overcoming the deformity, in fact, the latter seems readily to be increased by its use. Neither does manipulation appear to give any aid. In these cases if the segment of the extremity in which the fracture exists, is freely flexed so as to relax the tense flexor muscles, the use of either of the other methods, quickly relieves the deformity. Illustrations will be found in fractures of the tibia with great anterior angular deformity and in Colles' fracture in which complete separation often renders the reduction noticeably easy of execution. Under special conditions of deformity with inability to render the contractible force of muscles inoperative by any of the means mentioned, it becomes necessary to resort to subcutaneous division of the tendon of the offending muscle. Tenotomy is justifiable under such circumstances rather than to allow the deformity to persist and it is usually a harmless procedure, entailing no subsequent loss of power to the patient and in no way complicating the restoration of the injured member to perfect usefulness. When done, of course every preparation should be made for an aseptic operation. It is exactly the same procedure that is so frequently done for the relief of contracted tendons in the care of club foot.

Still, before resorting to any use of the knife in cases in which muscular spasm or contraction prevents replacement, it is well to bring the patient thoroughly under the influence of an anæsthetic. Anæsthesia is of two fold benefit, it not only does away with all resistance to replacement from muscular action, thus obliterating the principal cause of deformity and allowing the easy and successful application of the means of replacement already considered; but it also enables the surgeon to make a complete diagnosis, to learn thoroughly all about the special peculiarities of the fracture. In no other condition can the surgeon so satisfactorily examine and care for a fracture, besides it saves the patient from all suffering and no resistence is offered to any manipulations. Are there any reasons against its use in all cases? The following have been urged: First the danger of death to the patient from the anæsthetic itself. Anæsthesia always carries with it some danger to life, but the great care and watchfulness all practice in its administration together with the many means we now possess of overcoming its effect when the first manifestations of danger show, reduces its harmful effects to the minimum degree so that the danger from this source is practically very slight. Second, during the stage of excitement produced by the anæsthetic in many patients, there is much likelihood of the uncontrollable movement of the patient, causing great harm at the site of the fracture, by the sharp ends of the fragments, a simple could be easily converted into a compound fracture, arterial or venous trunks torn open, nerves destroyed or muscles badly lacerated.

This liability constitutes a real danger during the administration of an anæsthetic in cases of fracture and when it is given, every means possible to prevent any such occurrence should be carefully adopted by the surgeon, by securing absolute quietude to the injured part. The majority of patients will come under its influence without any demonstrations that will produce damage.

The rule followed by myself is to invariably administer the anæsthetic, first in all cases in which there is the least particle of doubt in my mind as to the nature and condition of the fracture after an examination with ordinary inspection and painless manipulation of the part injured—second in cases in which the displacement cannot be readily and early overcome. The popular impression that if a fracture is perfectly "set" in the beginning, the progression to satisfactory recovery is correspondingly certain and easy, is not to be treated lightly. There is an element of truth in it, for successful replacement means subsequent rapid abeyance of irritation—the ends of the fragments in close contact with each other and all the other conditions necessary for rapid disappearance by absorption of the debris of the injury and equally rapid and regular deposition of the elements of repair and perfect ossification. There is scarcely any doubt that the closer the ends of the broken bone are brought together the sooner union will take place and that union will be firmer, also will be accompanied with less deposit of callus and correspondingly less permanent deformity.

No attempts whatever at replacement should be made until after the clothing covering the neighborhood of the injury has been removed.

Accept a caution as to the manner of removing the clothing. It should be accomplished with gentleness and freedom from pain to the patient, or disturbance of the fracture itself.

Neither should attempts at replacement be made until after a study of the situation and conditions of the fracture have allowed the surgeon's mind to come to some conclusion with reference to the kind of dressing which it will be necessary to apply. To prevent the recurrence of the displacements this examination should enable him to place the dressings ready at hand for application, quite as soon as the replacement is satisfactorily accomplished. It is very easy to understand how all these preparations will save the patient much pain, prevent unnecessary disturbance of the fracture and provide for a regular and methodical treatment of the injury.

By retention is meant the adoption of such measures and the application of such apparatus as are necessary to maintain quietude and perfect position in the fragments during the time necessary to secure complete ossification and restoration of impaired function.

The necessity for the use of retentive apparatus arises from the fact that the reproduction of the original deformity of the fracture is an ever present danger because the forces which produced it reassert their power just as soon as the means employed for the reduction is discontinued.

It is to be borne in mind that every plan of procedure adopted, that all means of treatment instituted have their object first and last in the comfort of the patient, both local and general. It is therefore an imperative necessity that the surgeon be sure that each and every appliance made use of shall not in any way, add to the discomfort of the patient or increase the damage at the seat of the fracture already done by the injury.

Especially should the surgeon be assiduously watchful to prevent the harmful effects of pressure or constriction. Remembering at all times that even in health the skin quickly rebels against the evil effects of pressure and that the blood vessels speedily loose their function under the influence of constriction. The liability to harm is increased in a manifold degree when these hurtful agents are allowed to act upon tissues in which the vitality is already greatly diminished by the same injury that produced the fracture.

It is far better that the injured parts should be left entirely free of all appliances than that any harm should result from their use. However it arises, my experience has demonstrated the fact that the opinion is a common one among many people that when dressings are once applied to a fracture they must not be disturbed in any way by the patient. Hence it is not an uncommon thing to find patients suffering untold agony and yet patiently awaiting the arrival of the doctor to relieve them from the pressure caused by a rapidly swelling member rendering a bandage too tight. The best rule to follow is to warn every patient to cut all bandages provided the pain persists, certainly if it constantly increases after the dressings are applied and to merely keep the injured parts as quiet as possible until a rearrangement can be made at the next visit. It would seem impossible for the most experienced surgeon to estimate to a nicety just how much swelling will occur or how great the loss of vitality in the tissues in any given case of fracture may be. So it is far the best plan to provide the means of safety in case harm is likely to arise from either cause by giving directions to loosen the dressings. These instructions apply especially to the first dressings used in the treatment of any fracture. It is my conviction that first dressings should always be of a temporary nature loosely applied and easily removed. It is not an imperative necessity that great force should be used to keep the ends in close apposition early in the treatment of a fracture for there is ample time to mould and manipulate them into position after the irritation in the surrounding soft parts has begun to subside. Be ever watchful and diligent not to do harm.

The appliances made use of for the retention of fractures are as follows viz: Bandages, starch, plaster-of-Paris, silicale of sodium and special apparatus.

First, bandages may be made and are usually made from ordinary unbleached muslin; the selvage should never be left on. Some surgeons make use of flannel for bandages. The most common and useful width is three inches. They should be rolled very firm. The elasticity of the flannel bandage is immensely increased for some purposes by having it cut on the bias as it is termed. The size of the bandage mentioned is very satisfactory in its application to all fractures of the extremities and the bones of the skull. In fractures of the fingers the bandage should be no more than one inch wide. Those of the trunk require a wider roller, say six to eight inches. Bandages are used for the purpose of retaining splints and other appliances in contact with the injured parts and should always be applied evenly and smoothly so that the force exerted through them shall be evenly distributed. When the part is of different thickness in different positions of its extent this smoothness of application is accomplished by making use of the single or double spiral through reverse turns as illustrated.

The application of a bandage next to the skin in the early treatment of fractures is fraught with great danger and never should be used. When so used it is called the initial bandage. This initial bandage may be used, and is of great service in the later history of many fractures in overcoming oedama, resulting from interrupted circulation, from a weakened condition of the vessel walls after prolonged pressure from splints or from the dependent position of the extremities during the first attempts at use. It is useful also for the purpose of equalizing pressure in cases in which splints are applied only to the upper segment of an extremity, as for instance in many fractures of the humerus. Under this circumstance the initial bandage may be applied to the uninjured fore arm and prevents swelling of the arm likely to follow the pressure of the splints upon the arm. The bandage should extend from the base of the fingers to the elbow. This method of equalizing pressure should be remembered and prac ticed whenever constriction on the extremities is necessary in any position of their extent above the wrist or ankle.

The scultetus bandage is very useful and easily applied in cases in which for any reason it is best to avoid lifting the injured part and to relieve or increase the pressure with the least possible amount of disturbance. It is made by cutting an ordinary roller into strips sufficiently long to more than encircle the limb after all strips have been put into place. These straps are placed in succession so that each one overlaps its neighbor one-half the width of the bandage, they are fastened together by a single thread sewed through all of them down the center. This makes a many tailed bandage.

The ends of one side are drawn beneath the injured limb until the thread which unites them is opposite the middle of the limb; the ends are then drawn into position over the top of the limb commencing with the highest strip. As each successive strip overlaps its neighbor, the bandage becomes firm and self-sustaining after the first and last strip is fastened with a pin.

Fracture of the Skull.

John M., 19 Western Ave., age 58, American, carpenter.

Two years ago this man received a blow on the top of the head, about four inches in front of the occipital protuberance and a little to one side of the median line. He was rendered insensible for some time. As he holds his head down you can see quite a depression which illustrates very beautifully what we mean by a punctate "stellate" or "circumscribed" fracture of the skull which is likely to occur from a blow from the corner of a brick, the edge of a hammer or any other hard substance having blunt but well defined edges.

You notice that the fracture is some distance away from the motor area of the brain, and hence the impingement of the bone proper does not make any pressure on those areas, consequently the patient has no special interference with the motion of the extremities. However, he has had severe attacks of headache, nausea, vomiting, general debility and a numbness of the right arm and fingers of the right hand.

All these symptoms go to show that there is a connection beween the injury and the symptoms. They are not so well marked as they were in the young man before you at last clinic who had reached the stage of epileptic convulsions. Nothing of the kind is present here.

You have here, then, a stellatate, circumscribed fracture in which an operation should be done immediately for its relief, even though the symtoms are not severe at the time. This is the conclusion that we have reached lately. Formerly, it was thought an operation was not the thing unless the symptoms of compression were present—slow, heavy respiration, puffy cheeks, and patient insensible to all manner of irritation—a "living dead man" as it were. But the profession have now gotten to the point where they believe that if a patient has received a wound of this nature, that he should be subjected to an operation, and the depressed portions of the bone elevated, not especially because of the present symptoms, but because of the after results, such as epilepsy.

I am inclined, therefore, to advise this patient to have the bone elevated. We do not consider the operation of trephining under aseptic precautions a dangerous procedure, and under those precautions there is no reaction.

We will advise the patient to come into the hospital and have the bone elevated.

Case 3—Mr. George S., 304 Washington Boulevard, age 39, American, bookkeeper.

Now this is a very interesting case because the sequelae which follow, depressed fractures of the skull not properly treated are so terrible. In early childhood this man received an injury on the head, near the parietal eminence. He recovered, and was apparently well until about two years ago, when he received another blow in the same place. Since the second injury he has been gradually loosing his mind as well as his general health. You can see this punctate fracture. I will say that every fracture like this should be exposed early, and the depressed bone elevated. If this had been done in this case I think it is very probable that the man would not be in this condition now. The loss of his mental power has gradually increased until now he does not know what he is doing. We propose to uncover this spot on the head and trephine. in order, if possible, to lift up that part of the skull which is depressed. First, you should have the patient thoroughly prepared by carefully shaving and scrubbing the entire scalp, then make a wide horse-shoe incision, and turn back the flap containing all tissues down to the bone. Now I have gotten down to the root of the fracture, and find that the skin adheres to the bone, requiring a little force to separate it. You notice the manner in which I make the flaps. This is sometimes called the trap-door flap, for it falls down something like a trap-door. The soft parts are dissected off, and you can see the scar very plainly indeed. The incision should be made directly through the tissues, and all parts of the scar made bare, then the skull is opened with this circular saw which I hold in my hand. It is called a trephine. It has a pin in the center as you see, which, by a series of rotations, is fixed in the bone. This enables you to make the trephine cut a groove at any desired spot. This point will, of course, go through thé bone more quickly than the saw, so that after you have made the saw take hold you must remove the point to prevent its going through the bone and projecting into the brain. The saw is conical in shape, narrower at the cutting edge, so as to allow of a considerable amount of force, and at the same time prevent its suddenly going into the cavity. By going on carefully and measuring the distance sawed accurately, you will be able to make the opening without causing much hemorrhage. You will have a little hemorrhage when you reach the diploe, which indicates, you know, that you are through the outer table of the skull. You know that the inner table of the skull is very thin. There is not a great deal of danger of hemorrhage from the membranes, but it is understood that you will rupture as few of the small vessels as possible in breaking up the adhesion of the membranes. I try to embrace the main portions of the depression in the trephine, and in consequence of the depression the inner table is uneven, hence more care must be exercised so that when these adhesions extend through there shall not be a sudden tearing of the membranes. We have trephined the skull in this arena on three separate occasions in which it required the full depth of the trephine to penetrate the bone on account of hypertrophy, then we were compelled to pry out the button instead of pulling it out with the trephine. There is a very thin paper scale of bone on one side that the saw did not cut, which I will break off. By examining it you will see how close you can come to the brain without doing injury. By the aid of the trephine I have been able to lift out the depressed portion of the skull. We have a very slight hemorrhage from the rupture of the small vessels from the dura mater which have penetrated the cicatrix. As far as I can see the membranes are perfectly healthy. They do not bulge into the opening as they would if there were pus or fluid behind them. They are light in color and I see the pulsation of the brain. We think that all has been done for this young man that can be done. Nothing will be done to this wound but to sponge it out, suture the flaps in place and protect the wound well by iodoform gauze and borated cotton dressing. The space will soon fill up with a blood clot and form a natural protection to the parts. The flaps of the scalp fall readily into position and it requires but a little time for adhesion to take place in this vascular tissue. You notice that I did not apply the stitches very closely because adhesion takes place quite as well, and it allows the escape of any serum that may form. I feel as if I would rather have a good blood clot below the scalp to hold it in position. Of course I cannot say as to what the results will be in this case, he is in such a bad condition mentally and physically, but with great care exercised during the operation its successful termination and the careful subsequent attention which he will receive, it is reasonable to suppose that he will get well. With the care that is given there is very little danger in doing the operation.

FRACTURE OF VERTEBRÆ.

Mr. W. The patient we bring before you is a man who fell from a height of about eighteen feet, four days ago, and we find the present condition of affairs. Have you any pain? No. Did you have any? I had a great deal at first in my back. What were you doing when you fell? Holding rivets in building a tank. And you fell about eighteen feet. How did you come to fall? I slipped and struck on a board before reaching the ground. Do you know what part of the body struck? A point between the shoulders. What happened after you fell? I had no power to move the legs. You have no trouble about your head or your shoulders anywhere? No. Can you lift this leg? No. Can you lift the other one? No. What am I doing now? (Prof. Parkes illustrated here the absence of all sensation in all parts below the fourth rib by a series of pinches not felt by the patient.) You see demonstrated the absolute loss of motion and sensation as high as the fourth rib. It is the same on both sides. Now let us see you breathe. If you are accustomed to see a naked person taking a long breath you will notice a very different movement during the act of respiration from what is present in this man. It is apparantly almost entirely abdominal, but the abdominal walls are moved purely by the contracting of the diaphragm. The action of the diaphragm pushes the abdominal walls out, and they fall in when it is relaxed. Now let us see what is the nature of the accident that would produce these symptoms. An injury to the spinal cord by which its function is destroyed would do it. Let us look at the spinal column by turning the man on his side slowly and carefully, moving the entire body at once. First, I notice a fullness, a distinct round prominence between the shoulders, but he tells me that he has always been round shouldered, still this prominence is abrupt, stands out from the general bend. In the neighborhood of the cervical region of the spinal column, I make a series of depressions to detect where the soreness is and find none. Now tell me when it hurts you. There! does that hurt you? Just here about the middle of the posterior border of the scapula he complains of pain on pressure. Now if you look at the spine above and below this point I think you will be able to see easily a prominence which you could not find anywhere else, and it is tender at this point, especially when I make lateral pressure. I get something else, a harsh, grating sensation, as if two broken bones were rubbed together, the sign of fracture termed crepitus. Hence we know this man has a fracture and displacement of the fourth dorsal vertebra. The displacement causes a compression of the cord at a level with the fourth intercostal nerve and that limits the point at which sensation and motion end in this case. These injuries explain exactly to you all the symptoms you find present already elicited by our inquiries. Your anatomical knowledge tells you of nerves which are given off here. He has motion and sensation above the injured vertebræ, but neither below it. Can you pass your water? I cannot. Have your bowels moved? Yes. Did they give you anything to make them move? They did. He has had several doses of magnesium sulphate. This is a very interesting case for you to study and remember. You will meet with them frequently. They will be among the most important cases that you will have to treat because the sequelæ are so terrible and the ending so universally fatal. There is only one condition possible, where these symptoms are present, from which the patient will recover, and that is where there is a laceration of some blood vessels or contusion of the spinal chord, in which case the symptoms are sometimes only transient, lasting until the pressure upon the spinal chord has been relieved by the absorption of the blood clot. In this patient the paralysis and loss of sensation came on immediately after receiving the injury, which indicates that it is probably due to an injury of the cord, or to compression by a displaced bone, and not to pressure from a clot of blood due to laceration of some blood vessel. Of course the vitality of the parts below the injury is very much impaired, and you will expect to have disturbances of the bladder and rectum.

When you come to introdúce the catheter you will remember that the urethral canal has lost its sensibility. It is always best to use the soft catheter to relieve the bladder of its contents, never be without one. Be careful not to introduce into the bladder any septic materials, be sure that your hands and your catheter and the meatus are aseptic. Be sure that you do not bring on cystitis, it will come soon enough. You must use the catheter often enough to prevent over-distention. It must be left in until you are sure that there is no residual urine in the bladder. If the urine becomes a little cloudy, then you must resort to antiseptic solutions as washes. Irrigate the bladder with a saturated solution of boric acid in warm water.

Then it must be remembered that the abdominal walls are paralyzed and that you must stimulate the bowels. You can do this by the use of the sulphate of magnesium or other cathartics. The greatest trouble which you will have is from the effect of pressure on the patient's body from contact with the bed. A constant pressure of the clothing and of his weight on the bed produces sloughing. If you subject your own body to pressure at any one point continuously for five minutes there will be produced a redness and if continued this would lead on to sloughing or gangrene even with the sensation of the parts perfectly normal. Special attention must be given to the patient to prevent the occurrence of these bed-sores. This is accomplished in the easiest manner by means of a water bed, with which the pressure is equal on all parts, the patient sinks into it and the pressure is changed constantly. If you cannot get a water bed, then you must resort to cushions and pads as other means of comfort to the patient, together with frequent changes of position. A fracture like this to the dorsal region of the spinal column is more likely to get well than if it were in the cervical region. While a fracture in the lumbar region or sacral region is still more favorable. Now, is there anything to be done for the patient? Yes. Special care is to be given him, particularly with reference to movements of his body. In removing the patient from the place of injury to his home or to the hospital or in changing his position in bed, be very careful not to twist the spinal column. Be very careful to move all of the parts of the body at the same time. Extension and counter extension will sometimes remove the pressure and cause relief and should always be tried. This method has in some cases taken off the pressure and restored fractured bones to their normal position. If the application of this method replaces the fracture and relieves the symptoms at once, you will of course make some application to the patient's body, to retain it in this position. The best means is a plaster-of-Paris jacket, made out of a blanket. The plaster-of-Paris will fit every elevation and depression of the body, will be comfortable to the patient and will prevent movement. If by all these efforts you fail, is there any operation which is justifiable? Of late surgeons have begun to believe that they are justified in cutting down the seat of fracture and removing all loosened fragments or portions of bone which seem to produce any harmful pressure. This is done by means of the chisel or trephine after making a long central incision down to the spinous processes and uncovering the laminæ and pushing aside the muscles with the periostom. Usually the laminæ and corresponding spinous processes of several vertebræ will be removed in order to uncover the area of cord involved in the compression. This operation was performed a few days later. A continued fracture was found. The laminæ and spinous processes of the two vertebræ were removed. There was an improvement of the area of sensation and motion to a distance of six inches below the original line. There has also been an improvement in the action of the bowels and bladder. Treatment is being continued by means of an extension aparatus. The difficulty in these cases consists in the fact that the procedure merely removes the cause of counter pressure, but does not relieve the direct pressure which is produced by the cord being acutely bent over the lower portion of the fractured body of the vertebræ, and held in that position by the weight of the body above the seat of fracture. In many cases also the injury has been so severe as to destroy the continuity of the cord hence no operation can relieve them.

FRACTURE OF THE RIB.

Wm. O. 75 W. Monroe St., Age 38, Irish, Machinist.

Two weeks ago this patient received a severe blow from a fist upon his breast. Since that time he has suffered severely especially while coughing. Making pressure upon the seventh rib while I direct the patient to take a long breath. I get a little preternatural motion and a little grating. We have here a broken rib. In order to immobilize this fracture we shall shave off the hair and apply an adhesive plaster bandage, six inches in width and extending from a point six inches beyond the spine around the injured side and six inches beyond the sternum. This will be left in place for about six weeks. It will limit the motion of the chest wall and consequently control the pain. At the end of six weeks there will be perfect union of the fragments and the patient will have been entirely relieved by this simple treatment.

SEPARATION BETWEEN EIGHTH RIB AND COSTAL CARTILAGE.

Selma N., 9 S. Curtiss St., Age 19 Swede, House-maid.

You saw this patient recently. She has a great deal of pain and distress during the act of respiration, dependent upon the separation of the eighth rib from its costal cartilage. This condition has existed for several years having been caused by a fall upon a hard object. What I purpose to do is to uncover the rib, perforate the adjacent parts of the rib and cartilage with a drill, introduce a cat-gut suture and bring the parts accurately together. Of course, it is necessary for us to proceed very carefully here for it would be a very easy matter to enter the peritoneal cavity. I now elevate the end of the rib into the opening of the wound. I think that I can pass a strong needle directly through the rib and the cartilage.

You can see that it is not such a difficult operation to uncover a rib for resection. I have now passed the needle armed with a good strong thread through the rib and cartilage and have securely united them, I am now sewing up the wound with a series of sutures from the bottom. It will be dressed in the usual way.

EPIPHYSIAL FRACTURE OF THE UPPER END OF THE HUMERUS.

This boy, ten years of age, fell from a fence five weeks ago and sustained an injury to his arm, as is shown by this unusually well marked projection, about two inches below the acromion process on the anterior surface of the arm.

In examining the character of the damage done by violence applied to any portion of the extremities, you must always compare the injured part with the corresponding point of the uninjured extremity; for in that you have an unerring guide to refresh your minds as to the normal condition and will be able, with some degree of certainty, to detect displacements in the injured member, Now, as the injury in the case before us is close to the shoulder joint, let us first ascertain if there has been any harm done to the joint itself on the injured side, by carefully comparing the salient landmarks of these two shoulders. In this case the condition can be determined with the utmost degree of certainty, because such a length of time has elapsed since the injury that all swelling from effusion of blood or serum has disappeared from the neighborhood of the injury.

Feeling first along the extent of the clavicles, it is found, both by touch and by sight, that they are exactly the same on the two sides. Next, a thorough examination of the length of the spinous processes of the scapula fails to show any deviation from the normal condition. Therefore we can unhesitatingly assert that there has been no injury done to these bones. So, also, the acromion processes of both sides are easily manipulated by the fingers, and ascertained to be free from any deviation in contour and from the existence of any abnormal motion. Now, hiding the seat of the deformity from view with my fingers, we compare the general aspect of the two shoulders, and find that there is no difference whatever between them; they possess the same roundness, evenness and smoothness of contour on all their surfaces. Next, we put the extremity through the motions permissible at the shoulder-joint, and find that there is some limitation to the full degree of motion on the injured side. Still, it does move freely and easily in all directions within this limited range of motion. We examine the axillary space, and find that it contains nothing abnormal. From these facts we conclude positively that in this case there is no injury whatever of the joint itself.

Next, we examine the humerus, and find, first, that its direction is changed as compared with the uninjured bone, that its lower end projects too far backward, and, upon inspection of the upper end, we easily discover this unusual prominence just below the shoulder-joint, and also ascertain that it is directly continuous and in a line with the shaft below, Hence there has been in this case a solution of continuity, or fracture, at the upper end of the humerus, followed by the forward displacement of the upper end of the lower fragment. It has been displaced so far forward that it stands entirely away from the direction of the short fragment still attached to the head of the bone; the broken surfaces are absolutely separated from each other.

Now, I ask you to remember the boy's age, a very important fact to bear in mind in determining, in children, the diagnosis of an injury to the long bones close to their extremities. Your knowledge of the development of the long bones brings to your mind immediately the recollection that just here is a weak point. It is produced by the epiphysis, or rather the line of cartilaginous deposits between the epiphysis and diaphysis, which remains unossified until about the eighteenth year, in order to provide for the increase of the bone in length. So that, in all these cases, if you bear in mind and can determine the presence of the well-known signs of fracture, such as swelling pain and ecchymosis, loss of contour, deviation in direction, proximity to a joint, prompt recurrence of the deformity after perhaps easy reduction, and crepitation, you will scarcely ever fail to recognize the existence of an epiphysial fracture, such as was certainly produced in this case from the fall which this boy suffered five weeks ago. This is certainly true so far as this case is concerned, now that the obstacles to the recognition of the normal landmarks have entirely disappeared with the total absorption of all effusion.

When the point is greatly swollen and the subcutaneous tissue overfilled with such effusion of blood and serum as would obtain immediately after the injury, the determination of the exact nature of the injury might be attended with the greatest difficulty and uncertainty, in fact, might have been absolutely impossible.

This case also gives an excellent illustration of angular deformity, forward in this instance and extreme in degree It also demonstrates that firm and solid union will take place between broken bones, even if the broken ends are not anywhere in contact with each other, provided one of the broken ends is held in contact with some portion of the shaft of the other fragment.

Notice, again, that, notwithstanding the presence of this deformity, the boy has a very useful and movable joint. The extent of range of motion is limited somewhat, but with use will increase from day to day until it is restored quite to the normal condition.

Is any operation advisable in this case to overcome the deformity? I think not, unless it be the rather simple one of exposing the upper end of the lower fragment and chiselling away this projection, mainly to prevent ulceration of the skin covering it, which seems imminent.

The dressings necessary to apply in a recent case of epiphseal separation or fracture of the upper end of the humerus are simple, and I will illustrate their application on this boy's uninjured arm.

Take a strip of adhesive plaster two inches wide and a little longer than is sufficient to reach entirely around the patient's body; make a loop in one end of it considerably larger than the circumference of the patient's arm at the seat of the injury. This loop can be made permanent by a safety-pin or, better, by sewing it. It is now carried over the extremity and over the humerus until it reaches just to the upper end of the lower fragment. The deformity is then reduced by pressure backward at this point with one hand, while the opposite hand at the elbow makes extension and at the same time draws the elbow forward. While the arm is held in this position, with the deformity reduced, the plaster is carried around the patients body over its posterior surface and held in contact with its surface until adherent. The elbow is then fastened in its forward position by a second strip of plaster carried around the elbow and over the opposite shoulder in front of the body, and the hand and forearm are supported in a sling.

You can readily understand the mechanism of this arrangement: the loop of the plaster around the upper end of the humerus, when fixed by its attachment to the body, is the fulcrum, the long humerus, is the lever which reduces the deformity, and the second strip of plaster holds the lever steadily in position. The loops of plaster surrounding the arm should always be much larger than the circumference of the latter, in order to avoid impeding the return circulation. This dressing is very simple, is easily applied, the necessary materials are readily obtained, and it is thoroughly effectual. It should be examined, as every other dressing for fracture should be, from time to time, to ascertain whether it properly fulfills the requirements of the case. I have always found it proper to introduce between the arm and the side of the chest a single thickness of muslin, to prevent excoriation from retained secretions. The dressings should be retained in perfect position for at least four weeks.

Fracture of Neck of Humerus.

Dina F., 1461 State St., age 60, Russian, housewife.

This lady fell down about two months ago and hurt her shoulder, and she is supposed to have a dislocation. There is but little deformity as far as the contour is concerned. There is a little enlargement which is unnatural. When I rotate the arm I find that this moves, so it is connected with the shaft of the bone. As I move the arm backward and forward I find that the prominence moves, and when I place my finger on it I feel a depression which tells me that my finger rests on the head of the humerus. You notice the shoulder joint is wider from before backward than it should be, showing that there has been a separation of the continuity of the bone sufficient to increase the width of the bone opposite the tuberosity. Of course an injury of the kind cannot occur without injury to the muscles and a tearing of the capsular ligament. There is a falling forward of the humerus, and it lies in front of the acromion process. I am sure that in this case we have a fracture extending into the shoulder joint. The motion in the joint is very good, and I do not know that I can suggest anything more to be done than the use of massage, and active and passive motion.

Fracture of Internal Condyle.

Theo. S., 222 DeKoven St., age 38, American, laborer.

This man says that he hurt his arm five weeks ago by falling and striking his arm and shoulder on the walk. He cannot make complete extension, and cannot flex the arm beyond a right angle. He says that it catches him in the elbow. I find the radius in its normal position, and the other landmarks in their proper places. There is a very slight protuberance on the inner side of the injured elbow. It is made up principally of the internal condyle, but when I hold the arm up in this manner and rotate it I get a soft grating sensation. The indications are that there has been a slight fracture with slight displacement of the internal condyle. It may be that there has been a fracture in to the joint separating the external condyle. He makes very fair flexion and extension and I am satisfied that if he were asleep we could make more motion. He has been using his arm to much in his daily labor. The thing to do is to give the arm rest, and apply hot fomentations. If he cannot stop working, then the best thing is to put him to sleep, and put the arm through motions, then let him put it through passive motions every day, and put on large fomentations covered with some impervious dressing. He should also bathe the arm with warm water and alcohol, and there is not much doubt but that the motion will be restored.

UNUNITED FRACTURE OF THE ARM.

Mrs. C., 488 Halsted St., age 45, German, housewife.

Fourteen years ago this woman had this arm broken, and we have an excellent example of an ununited fracture. And it proves again what I told you so many times that the cause of the non-union is the existence of a foreign body between the ends of the bone. Notice the large amount of flesh between the ends of the bone here. The patient has quite a number of scars marking the situation of sinuses along the clavicle and shoulder, and a few are to be seen on the neck. The commencement of this trouble was an osteomyelitis which weakened the bone.

Just how much of this is constitutional, we cannot say, but I am inclined to believe that the most of it is. The clavicle is the most common seat of specific manifestation in bones, therefore, believing that the trouble is specific, we will advise her to take large doses of Pottassium Iodide and report to us. If she will take it three months out of the year, I am sure that she will be very much benefited.

Colles' Fracture.

This woman received a fall. In trying to support herself, the arm was thrown forward, and the weight of the body came on it, producing the injury which you see. I have not examined the injury yet and cannot say what the nature of the trouble is, but judging from the history of the case and the location of the injury, together with the age of the patient, of course I suspect what the trouble is.

You know the bone becomes very brittle as age advances and is therefore liable to fracture. The lower end of the radius you know makes up the complete articular portion of the wrist-joint and the weight of the body coming on the hand, in falling, very often communicates the force to the radius and fractures it a half inch or an inch above its articular extremity, producing what we technically term a Colles' fracture. The name Colles' fracture was given to it from Colles of Dublin, who first called special attention to this kind of fracture. As I hold the arm up in this manner you can see some of the deformities; the riding of the lower fragment on the dorsum of the bone causing a projection at this point; just in front of this there is a depression. All of this gives to the hand and wrist somewhat the appearance of a silver fork, hence it is sometimes called the "silver fork" deformity. If we turn the hand over, we find the corresponding prominence and depression existing on that side. Again we have the usual symptom of pain. The patient did not hear any sound accompanying the injury Besides the deformity already mentioned, there is a foreshortening of the radical side of the fore-arm, from the over-riding of the ends of the bone. We also have preternatural mobility. When I seize the radius just above the point of injury, and with the other hand grasp the lower end of the bone as closely to the carpus as possible and make this motion, I not only get preternatural mobility, but also the rubbing of the rough ends of the bone crepitation. All of the other signs, of pain, redness and swelling are also present. We therefore have present a Colles' fracture, with all of the symptoms.

Usually the lower end of the upper fragment is impacted into the upper end of the lower fragment. This with the riding of the ends by each other makes it extremely difficult to retain the short lower fragment in the normal relation with the upper fragment. The fracture is termed Colles' fracture when the lower fragment is an inch and a half or less in length. Not infrequently when the weight of the patient is great, you have additional complication by having the ulna fractured and its end driven through the skin, producing a compound fracture.

A common sequela which causes the patient a good deal of trouble is an inflammation in connection with the flexor and extensor tendons lying in the grooves at the lower end of the radius, limiting motion and giving the patient more trouble than the fracture itself. Therefore, I have come to the conclusion that it is well to pay attention to the inflammation primarily, rather than to give your whole attention to the bone, I might mention a case of Colles' fracture which was in the hospital not long since. It was a case of a young man who got a "header" from a bicycle and nearly broke his head, resulting in breaking his arm. For four weeks he was uncontrollable on account of delirium, tearing off the various dressings that were applied until a plaster-of-Paris dressing was made, and at the end of four weeks there was nothing of it left, yet the patient had a good result, in fact about the best that I have seen, So you will give attention to the soft parts and not try to hold the fragments in place by forcible compression.

There are a good many methods of treating Colles' fracture, but I think the best method is the one which we shall illustrate to you. I find the "pistol" splint on the patient.

Formerly, all fractures of this kind were treated in this way. Now the "pistol" splint is not found necessary. I only use the internal and external splints. You will remember that you are not to use splints on any portion of the body without thoroughly padding them. I have called your attention to this so much, yet not two weeks ago I was called in consultation with a graduate of this institution, a very intelligent and good man, to a case of fracture. When I arrived I found a splint used without any padding whatever. The splint made blisters wherever it touched. Under no circumstances use a splint without covering it thickly with cotton batting. You can almost always find it, if not use three or four thicknesses of flannel. It will prevent injury to the skin, deeper tissues and circulation, and the splints will hold the fragments in position precisely as well.

The splints are held in position by means of roller bandages carefully applied with uniform pressure just tightly enough to maintain the position of the splints. The arm should be examined once a day until the swelling has entirely disappeared and then less frequently. You can expect firm union of this fracture in six weeks.

After the second week active and passive motion should be made in the wrist joint, to prevent stiffness.

FRACTURE OF THE RADIUS.

CASE I.—Frank H., 54 S. Carpenter St., Age 36, Irish, Laborer.

This man received a fall this morning, at which time he threw his hand forward, and the weight of the body came upon it, producing some injury to the wrist, or to its immediate neighborhood. Comparing the two hands, you can see a well-marked prominence over the posterior surface of the wrist on the injured side, extending upon the arm. There is not the peculiar deformity resembling the silver fork which is so often found in injuries in this situation. This prominence is soft, elastic and compressible, calling your attention to the fact that it is made up of effusion of blood and serum, and is not caused by displaced fragments of bone. This being the case we shall have to resort to other means to determine whether or not the continuity of the bone has been destroyed. The radius is covered with muscles in its upper part, but the lower portion of the bone can be readily felt. I seize the carpus and the lower portion of the radius, and making motion in this manner, I find that there is a little preternatural mobility produced, and at the same time I get a peculiar sensation transmitted to the fingers, which is called crepitus. We therefore, have a fracture of the lower end of the radius, oblique in character extending upward and backward.

There are a number of signs of fracture to which your attention has been called. However, they will not always be present, and sometimes, when present, they are not well-marked. So you will not be positive in your opinion that there is not a fracture, simply because you do not find all of the signs present indicating a fracture. You have an example in this case of the absence of the peculiar and remarkable deformity which, all but invariably, follows a fracture in this portion of the arm. Ecchymosis is also wanting, but there is pain, swelling, preternatural mobility and crepitis. These signs are quite sufficient to fix the fact in your minds that a fracture is present.

All that is necessary to do in this case is to apply the Moore's splint. It consists of a roller about two inches wide and an inch thick applied to the inner side of the ulna, at its lower end, and then an adhesive plaster about two inches wide is applied very tightly around the wrist over this roller. The object of the roller is to prevent the interference with the return circulation by the pressure of the plaster on the vessels.

After the deformity is corrected, and the plaster is applied, the pressure is sufficient to retain the fragments in their proper position. About six hours after the application of the adhesive plaster it should be cut across at a point opposite the roller in order to prevent the occurrence of œdema.

The arm should be carried in a sling which extends from the wrist to the elbow, and the hand should be permitted to hang free. This will have the same effect that was formerly obtained from the use of the pistol splint. The patient is advised to use his fingers at once, and passive motion of the wrist is made after the first week. The dressing is removed after three weeks and another one applied less tightly, which is permanently removed two weeks later. Passive and active motion is now employed freely, in order to prevent stiffness of the joint.

FRACTURE OF STYLOID PROCESS OF ULNA.

Ira H., Center St., Graceland, age 18, Swedish, marble polisher.

An enlargement exists on the inner side of this man's wrist, resulting from an injury which occurred several months ago. It is very tender. There has been a fracture of the styloid process of the ulna, and perhaps a dislocation which was treated for sprain by the use of tincture of iodine and liniments. The fracture is the same in character as the fracture on the radial side known as Colles' fracture, and should have been treated in a similar manner. There is no effusion into the joint. When I first saw this wrist I thought there might be a tuberculosis of the joint, but I find nothing of the kind. It has only the peculiarities to which I have called your attention, and it will always be a weakened joint. There is nothing that we can do for it surgically. It will always sprain easily, and I should advise him to wear a brace made of heavy leather in the day time to prevent severe straining of the ligaments during work.

Fracture of Both Bones of Fore-arm.

Noble S., 437 State St., American, carpenter.

This young man has had a fracture of both bones of the fore-arm. Four months has passed since the accident occur red, which consisted in a fall from a building. The arm was dressed in a plaster-of-Paris splint. You can see how easy it is to follow up the radius to the seat of fracture, and then the ulna in the same way. The bones are united at an unfortunate angle. The angle is a little outward and backward. He tells us that the arm is weak, that it is not nearly so strong as it was before the break. The fracture is of comparatively recent occurrence, and I have no doubt but that it will grow stronger with time, and make him a very good, serviceable arm as it is; but if he desires to have it straightened we will do this for him, of course. He will determine what he will have done to it. Now here is a case in confirmation of what I have told you in regard to the use of plaster-of-Paris casts in the treatment of fractures. You can not always know what is going on inside of a cast. Sometimes your patients do not complain of the accompanying pain. Not long ago I saw a case of Colles' fracture which had been treated with a fixed dressing of plaster-of-Paris, and when the cast was taken off it was found that both bones had perforated the flesh from the occurrence of pressure necrosis. So it should be a rule if you use plaster-of-Paris in the treatment of recent fractures, to cut open the cast within twenty-four hours after its application by making a longitudinal incision preferably before the plaster has completely hardened, and to inspect the extremity. In case there is evidence of pressure the cast should be removed and another applied.

Fracture of External Condyle of Humerus.

This patient comes with a history of having fallen upon the sidewalk a week ago striking his elbow. You notice the extreme amount of ecchymosis on the inside of the arm. It looks almost like gangrene. You must learn to recognize this redness, this change in the color of the skin, as meaning nothing except that there has occurred a laceration of blood vessels. I am able to extend his arm almost as easily as on the opposite side. He tells me he has been examined by another physician who finds no fracture. There is limitation of motion in the direction of flexion not in extension. Some individuals cannot extend the arm entirely. Some can carry the arm a little beyond full extension It is only by comparing the two arms and inquiring as to whether the patient has had an injury before that we can determine this in any given case. As I flex the arm it is all right until it reaches the right angle but beyond that he objects, and I find resistance to further flexion. I estimate between my thumbs the situation of the alecranon process between the external and internal condyle. There is no dislocation, as they are in line with each other. It is rather easy to determine in this case. The upper point of tenderness is over the external condyle. I can press on the internal condyle without causing pain, but pressure on the external condyle gives rise to severe pain. I am satisfied this man has an injury to the lower end of the humerus, limited in character. This displacement of the external condyle hurts the man pretty severely. By that action I force the external condyle down into its line and hence restore the joint surface of the lower end of the humerus. It is only necessary to put on an anterior angular splint. The old fashioned Fisk splint is a good one. It consists of two splints, one on the outside and one on the inside. We have a fracture through the external condyle, which always implicates the elbow joint. In these cases, always warn your patient of stiffness of the joint which may possibly occur in spite of the utmost care and the greatest skill in their treatment, We will dress this man's arm in the manner I have mentioned and use the heavy paste board in making a splint. It will be wet thoroughly so that when it dries it will answer every purpose of a heavier piece of board. I should prefer to put on the board splints. We have many of the signs of fracture in this case which you should bear in mind--the swelling, limitation of motion, the tender point. This one sign of the tender point will very frequently enable you to distinguish a fracture. I can make a great deal of pressure on the internal condyle, but not on the external without giving rise to severe pain.

After three weeks we will begin to employ passive motion each day in order to prevent stiffness if possible.

In case stiffness connot be avoided it is best to maintain the arm in a flexed position, because this renders it more useful than when extended.

FRACTURE OF FEMUR.

This young fellow had a horse fall upon him yesterday and he has as a result some injury to his thigh. He was conscious at all times during the accident but did not hear any break of the bone. He thought, however, that his thigh was broken, because he was unable to get up and he was conscious of the force which produced the injury. When he came in, the limb assumed a much more extreme position abnormally than you now see. Now you see that the toes are turned out, eversion of the foot, and there is a bow in the thigh in comparison with the other. These are sometimes due to spasm and shortening of the muscles of the thigh, always found if there is a fracture of the femur. If we measure from the anterior superior spine of the ilium to the internal malleolus we will find another sign of the fracture, and as you see we get an inch and a half of shortening. Another sign which is always present is preternatural mobility, motion in a position where it should not be found. Usually the sound made by the snapping of the bone is heard by the patient. By rubbing the two ends of the bone together we get another sign, that of crepitation. So that we have a fracture of the thigh in this patient. It is a simple fracture, simple because the skin is not wounded; there is no communication between the air and the seat of the break in the bone. If there were such a communication with the air it would be a compound fracture. Again it is a single fracture. Were it broken in many places it would be a multiple fracture. It is not comminuted as the bone is not broken in pieces. We have the sign of swelling now, and in a few days will perhaps have the sign of ecchymosis. I have no doubt that the bone was broken not by direct, but by indirect violence. Finally we have the sign of pain. You must be as familliar with all these signs as you are with your A. B. C's.

The treatment above all others for a fracture of the thigh is the one which you see made use of in this case. We take a piece of adhesive plaster four or five inches wide, a little wider at the upper than at the lower end, and carry it up to the seat of the fracture and apply it to the inner side of the limb. This is brought down to within four or five inches of the malleolus. It adheres intimately to the skin and gives a good broad support. A similar strip is placed on the outer side of the limb. The plaster is doubled back upon itself to a short distance above the malleolus to prevent the adhesive surface from coming in contact with the ankle-joint. A stirrup is fastened at the bottom of the foot for the double purpose of preventing the plaster from impinging on the malleoli and at the same sime to furnish an attachment for an extension cord which runs over a pully and to which is attached the necessary extension weights. And it is necessary to apply enough weight to overcome the muscular contraction. You know that if the boy is left on a flat surface like this there would be a constant tendency for the body to move in the direction of the extension. This difficulty is obviated by elevating the foot of the bed a little and by fastening the body to the bed by means of a wide bandage. A piece of a sheet will answer the purpose, but a stronger material is better. Two holes are cut in it for the arms and it is placed around the body and fastened to the bed. In this way the body is down hill and you have good, effective extension and counter extension by which the surfaces of the bone are pulled apart. The limb is shortened simply because of the powerful contraction of the muscles which pull the ends of the bone by each other. The continued extension and counter extension gradually tire out the muscles, so that the ends of the bone may be brought back to their normal position. This is the best and most reliable method of controlling fractures of the thigh.

In order to prevent the occurrence of lateral displacement of the fragments and rotation of the foot outward, a bag six or eight inches in diameter will be laid along the entire length of the extremity on either side. From four to eight narrow coaptation splints may be applied about the seat of the fracture but it is doubtful whether they are of any real value.

This case then affords you an example of a simple fracture of the thigh with all of the signs, of swelling, pain, loss of contour, preternatural motion, crepitation and loss of function. Ecchymosis is wanting. The patient is a young, vigorous man, noted for his muscular activity. I expect to show you next a fracture of the thigh on an old person who received a slight blow from falling down. When she came under our care she had complete eversion of the foot, loss of contour, swelling, pain, crepitation and loss of function, being unable to raise the heel from the bed. There was a decided shortening and the arc described by the trochanter major in rotating the femur was diminished. The upper border of the trochanter major is above Nelaton's line ¾ inch. No disposition to carry the ball of the injured foot to the dorsum of the uninjured foot exists nor to eversion of the thigh. These symptoms indicate, in a patient of this age, a fracture of the neck of the femur.

I desired to show you this patient for it is a case that you will frequently meet. She came into the hospital at 9 or 10 o'clock saying that she had a dislocation of the hip-joint. In the first place the age is against the probability of a dislocation. In the majority of cases of this character in patients above fifty years of age, the trouble is a fracture of the neck of the femur. But it would not do, of course, to say that it could be a dislocation. I saw an old man ninety years of age who was struck from behind by a runaway team. The pole of the wagon striking him on the sacrum communicated force sufficient to throw the head of the bone out of the acetabular cavity.

In diagnosing these cases you will frequently not find all of the signs present. At one time ecchymosis will be wanting, at another some other sign will be absent. The degree of pain varies very greatly in different cases.

When the fracture is smoothly transverse there is not the injury done to the soft parts that there is if the fracture is a long oblique one, and consequently much less pain follows, and there is less likelihood of the occurrence of ecchymosis.

FRACTURE OF NECK OF FEMUR.

Mrs. L. D., 170 E. Madison St., American, housewife, age 62.

I wish you to notice first the age of this patient. She is sixty-two years old. She received an injury to the hip by falling on the pavement.

We will take the measurements of the two limbs. Measuring from the anterior superior spinous process of the ilium to the lower margin of the external malleolus on the injured side we get a distance of thirty-three inches; on the sound side thirty-four and a halt inches. A difference of one and one-half inches. Measuring from the umbilicus to the external malleolus on the injured side, I find a distance of thirty-six inches; on the uninjured side thirty-eight inches.

Again, measuring from the top of the sternum, I get fifty-one inches on the injured side, and fifty-three inches on the uninjured side. So we get two measurements with a difference of two inches, and one with less. On bending the knees and flexing the thighs you see a difference of about two inches between the projection forward of the free surfaces of the patellæ.

There is then a decided shortening of the limb injured.

Turning now to the position of the foot itself on the injured side, you notice that there is complete eversion of the toes. We will see what the position of the trochanter major is. Drawing a line from the anterior superior spinous process of the ilium to the tuberosity of the ischium, you notice that the trochanter major, instead of being immediately below this line, is to be felt three-quarters of an inch above the line. The upper surface of the trochanter major then extends above Nelaton's line.

Now, we desire to make a differential diagnosis between a dislocation of the head of the femur and a fracture of the neck. First we take into consideration the age of the patient. Fractures usually take place at the neck of the femur at this time in life: dislocations are uncommon. It is not a dislocation backward on the surface of the ilium, for I cannot feel the head of the bone in that abnormal position. Besides, the trochanter major would extend an inch or an inch and a quarter above Nelaton's line, and there would be no power of motion in the joint. The patient is able to flex the thigh to a certain extent. Again it is not a dislocation backward on the ilium because the position of the foot in that case is just the opposite to what we have here, and the patient carries the ball of the injured foot on the dorsum of the sound foot.

It is not a dislocation anteriorly on the pubes, for I find the pubes free from the bone which would be present if the dislocation were present. In this dislocation there would be a lengthening of the limb and a fixed adduction.

I do not believe that it is a dislocation backward and downward into the obturator for foramen, for there is no flexion of the thigh and the head of the bone cannot be felt in that abnormal position. Therefore all of the signs of dislocation are absent; and owing to the age of the patient, the shortening of the limb, the eversion of the foot, and the movement of the joint, I am forced to believe that we have here a fracture of the neck of the femur. We do not have here a preternatural mobility, as in the earlier stages of the fracture, but there is a certain amount of immobility and loss of functions. We know, therefore, that union has taken place with shortening. The condition of the limb is as good as is usually the case in such accidents. If you get a repair of such a fracture with a shortening of an inch or an inch and a half only, the pelvis will tip to one side sufficiently to prevent a noticeable limp. In this case it will require only a slight lift on the shoe to prevent limping. It will be treated in the same way as the previous case by Buck's extension. As soon as the limb is put in the proper position, like this, the long external splint, extending from the axilla to the foot, is applied and is fastened at the body, thigh and leg. This splint is to prevent disposition toward eversion and is applied after the extension is made, not before. The cross piece is placed at the bottom to keep the foot on position and to protect it. A very important item in these cases is a proper bed. Scarcely any house has a suitable bed. You can make a bunk yourself out of boards which will be suitable for any case and in any house. It should be six feet and a half long, three feet wide and two feet high. The foot of the bed will be elevated a little and the patient will have nothing under the shoulders, but will have a pillow under the head, the weight of the extension in children should be 1-6 of the weight of the body. It may be necessary for the first few days to put on double that weight on as high as 20 lbs.

You frequently hear doctors saying that they do not like this method. If they do not have success with it, it is because they do not carry it out.

UNUNITED FRACTURE OF TIBIA AND FIBULA.

Anton, 699 17th. St., age 23, Polish, carpenter.

Family history—Mother has consumption. Previous history good.

What is the trouble, sir? You broke your leg. When did you break it? January 22. How did you break it? You fell down two steps and one foot went through. You would not think that a strong man would break his leg by falling two steps, but it takes only a slight force when the weight of the body is thrown on the leg, while in a disadvantageous position. You say this occurred in January. Where have you been all this time? In the County Hospital. How long have you been there? Nine weeks. This was a compound fracture of both bones of the leg. He comes to us with evidences of a sinus leading down to a foreign body, and gives us the history of a compound fracture.

Remember always that these granulations are very vascular and bleed freely. By the use of the probe I find here quite a fragment of bone which will need removal. If he will come into the hospital we will take care of him. He has been walking on this leg, but it is an ununited fracture. Usually ununited fractures do not unite while there is a piece of dead bone between the ends of the fragment. This is a case of delayed union in bone. I am inclined to believe that the fragments were not separated by soft tissue when he went into the County Hospital, for those gentlemen would have detected and removed this as they do their work well. It may be that it was a long time after his injury that this man reached the hospital.

Treatment.—The thing to do is to open the sinus and detach the dead bone from its surrounding tissues and remove it as soon as possible. There is a deformity of a bowing backward of the leg at the seat of the injury. It is a very common one, and is dependent on the weight of the limb itself. You will remember this and will prevent the deformity by the use of splints to retain it in a proper position. You must not be satisfied with having it set in a line, but you must look at it laterally as well and see that there is no bend antero-posteriorly. We use the sinus with the probe in it as our guide and cut directly down through everything to the surface of the bone. Here is the same old story which you have seen illustrated so many times. This case has been operated upon for ununited fracture and the operator made use of silver wire to hold the bones together. Not a year goes by but what I have to untwist a lot of wire which acted as a foreign body in bone. I do not see why surgeons use wire. If they will unite the bones without any foreign body between them and hold them in place with splints nature will make a union.

I have obtained a small fragment of dead bone placed between the ends of the fragments illustrating what I have said that the majority of ununited fractures depend not on the manner in which they are treated but in almost every instance depend upon the fact that a foreign body exists between the ends of the ununited bone. The foreign body may be a piece of wire, a piece of dead bone, fibres of muscular tissue or fascia. I have no doubt but the lower portion of these bones are separated by either a layer of muscular tissue or a layer of fascia. It is of very common occurrence for the bone to be needle-like in character and for the force to continue often after the severance of the continuity of the bone and thrust the ends of the fragments through the flesh. Frequently it is impossible to disengage them and you have the muscular fibres between the bones acting as a foreign body. You can see in the track of this wire, an unhealthy sinus running down behind the bone. Of course the wiring of them together was a useless thing to do. Now I have exposed a large fragment of dead bone equal in diameter to that of the tibia. As long as this fragment was here this man's leg could not get well. It will be necessary to split this fragment in order to remove it because it is very tightly wedged in by the callus above and below. One of the most difficult things you will try to do is to break a piece of dead bone. I will make this opening in the callus as narrow as I can in order not to weaken the bone. You see that this fragment is on the posterior surface and that accounts for the difficulty of its removal. It is hardly necessary for me to say that it would have been very much easier to have gotten out this fragment at the time of the injury than now and it could have been removed without giving rise to shortening. One other difficulty is the peculiar shape of the fragment. It is very necessary that all parts should be thoroughly cleansed of the septic granulations; we will remove them by means of a sharp curette. The cavity will be thoroughly washed and then packed with iodoform gauze. This will be rewarded with a rapid healing. If this is not done it will be very likely to show the results and cause a great deal of trouble.

The Same Patient Six Weeks Later.

Now, here is our very interesting case of compound comminuted fracture of both bones of the leg. You remember that this man was before us some time ago, and we opened the wound freely and removed a large fragment of bone equal in diameter to that of the tibia, and also smaller fragments, as well as three large wire sutures. We operated upon him about six weeks ago. Within two weeks after the operation he walked upon the leg. There had been no union for seven months before the operation. There are two lessons to be learned from this case. First: When you have a compound comminuted fracture, examine the parts under the skin. If there is no opening large enough to introduce your finger, make it large enough and find out the condition of the fragments. Remove all loose fragments. Second: In regard to the use of wires, I must say that I have no confidence in their use at all, whether they are used primarily or secondarily. Invariably, if their is any tension upon the wire it will cut its way out; it does injury by becoming a foreign body. My experience is that nature is able to take care of a compound as well as a simple fracture. And I am satisfied that you get as good results from the use of the antiseptic cat-gut as from the use of anything.

Ununited Fracture of Thigh.

The next case is one of ununited fracture of the thigh. The patient received a gun shot wound through the thigh about a year ago, resulting in the fracture of the femur. The soft parts healed promptly and kindly, but there has been no disposition toward union of the bone. The limb has been perfectly treated by fixation and by the use of splints. I can obtain no signs of roughness between the ends of the bone, so I expect to find an opening down upon the ends of the bone that they are covered with connective tissue, and there is probably also muscular tissue between the ends.

There are many different methods of securing union in these cases The simplest is that of putting the patient to sleep, as is necessary, and rubbing the ends of the bone together vigorously. Again, irritation is brought about by passing a needle in between the ends of the bone. The next is the subcutaneous method of introducing an instrument into the seat of fracture, and scarifying the ends of the bone in all directions, and break up all of the connective tissue between. The next method is that by the use of Dr. Brainard's bone drill. The drill is used in making various openings in the end of one bone through the opening in the integument. Finally you can cut directly down on the seat ot the fracture, remove the offending foreign body, and unite the ends of the bone by means of cat-gut sutures, silver wire, ivory pegs, or in any such aseptic manner; or you may approximate the ends of the bone and hold them in place without first uniting them.

The use of the suture material which cannot be absorbed, for the purpose of uniting bone, is becoming abandoned more and more, because the fragments can be held in apposition a sufficient length of time by the use of cat-gut sutures or by the use of splintsto secure union. If non-absorbable substances are used they are very likely to require removal at some future time. Scarcely a year passes that we are not called upon in this clinic to remove silver wires which were employed in uniting fractures a long time before.

I shall make an incision on the outer side of the thigh and expose the seat of fracture and, if possible, chisel off the ends of the bone. Of course it will require quite a large incision to enable me to do the work. I now have exposed the upper end of the lower fragment. You remember that I expressed it as my opinion that in the majority of cases of non-union in the bones, some foreign body was inserted between the ends of the fragments. We have a very beautiful specimen of what we call pseudarthrosis. Here is a membrane which is analagous to the synovial membrane. It is as nearly synovial membrane as it is possible to have outside of the true joints. I find the condition which I told you I expected to find. There is a space of three fourths of an inch between the ends of the bone. They never could unite in this condition. You can see the wide space between the fragments of the bone occupied by a portion of the vastus externus muscle. The patient has been walking on this limb for about three months, and partially the result of this, the ends of the fragment ride by each other a distance of two inches. I have uncovered the ends of the fragments and shall chisel away a sufficient amount of the end of each fragment in order to bring the ends of the fragments in line and at the same time approximate large bone surfaces. It is an utter impossibility to make extension on the limb sufficiently to bring the fragments into proper apposition without first shortening them. I shall remove only the half of the lower fragment. This operation is a very difficult one. It is not only difficult but it is a dangerous operation as well. You know that we have running near the bone the femoral artery and its branches and in an injury of this kind the relative position of these parts are so changed that you do not know just where you will find them. I remember a case of fracture of the thigh where the surgeon attempted to bring about union in this way. The upper fragment was treated without meeting with any accident. But unfortunately in treating the lower fragment the femoral artery was injured so that in the course of twenty-four hours a severe hemorrhage came on producing a very bad result. You will keep close to the bone constantly and the tissues are pushed to one side; in this way you will avoid the vessels and you will be able to bring together new surfaces of bone tissue.

You see that this wound has been sewed up perfectly tight. I do this because I have perfect confidence in the operation. It has been closed by means of three layers of sutures. The first layer united the periosteum, the second the muscular tissue and the third the integument. The sutures will have a tendency to stop hemorrhage. We will now apply a large cast of plaster-of-Paris including the thigh, the leg and if possible the hip as well. This will hold it better than anything else and we will place the thigh in a semi-flexed position similar to that of the double inclined plane, but not so complete. In the beginning of the term, you remember, we had a case of non-union of the femur before us, in which the fracture was very oblique, extending upward and inward. The upper end of the lower fragment was a mere splinter, extending as far up as the great trochanter, so that the femur was broken through and split up the greater part of its length. Now in that case we could not bring the fragments into accurate apposition, so we dissected out the upper end of the lower fragment and the case went on to recovery without any difficulty whatever. I am therefore sure that it is not necessary to remove the entire end that overrides the other. If you place the fragments in contact with each other the results will be the same.

COMPOUND FRACTURE OF THE LEG.

Mr. C., Waukegan, Ill., age 43, English, landscape gardener Family history and previous history good. Diagnosis.—Compound comminuted fracture of tibia and fibula, delayed union Osteomyelitis.

Just a year ago, this man came into the hospital six weeks after receiving a compound comminuted fracture about the middle of the tibia and fibula. His whole leg was in such septic condition that we thought he would get along as well with the limb on as if we were to amputate it. So we applied drainage tubes through the limb which was swung up. Incisions were made in all directions and the drainage tubes were connected with the irrigating tubes so that irrigation with sterilized water was kept up continually. By this treatment the man recovered sufficiently to be operated upon. The patient's temperature fell from 105 F. to 99 degrees within 48 hours after commencing the use of constant irrigation. The wound was so putrid that its odor could be noticed in every part of this large amphitheatre when the patient was first brought to the clinic. This subsided very quickly upon using constant irrigation. The wound having been changed to a comparatively aseptic condition we resected the overriding portion of the bone which was the entire caliber of the tibia and removed a good deal of the fibula as well. It has improved so much that it will now sustain his weight. It is a little short, but this can be remedied by means of a shoe with a thick sole. There is still remaining in this case a sinus leading down to dead bone, but I am sure that the dead portion is separated from the body of the bone. We will uncover it and see its character. It is so long since the injury occurred that we should suppose that a sequestum must have formed. Here I find a sequestum which I will remove and here is a piece of denuded bone. It illustrates what I have told you, that when you have a compound comminuted fracture in which there is a piece of bone lying across the bone horizontally, separated from the bone, it acts as a foreign body and should be removed. I will take off this spiculum of bone although it is not dead. I am very sure that it will die and will be troublesome to the assistant in caring for the wound. Of course, in all cases of compound fractures you will try to avoid any suppuration. You will do this by using every possible antiseptic precaution; thus many compound fractures will be converted into simple fractures without suppuration. But you will sometimes have suppuration in spite of all you can do, and there is nothing that will equal constant irrigation in these cases.

INFECTED COMPOUND FRACTURE OF FORE-ARM.

Chistian L., 190 Wood St., age 29, Norwegian, cabinet maker.

Four weeks ago this man fell from a three story building and received a compound fracture of the lower end of both bones of the fore-arm, the fracture having been so serious that a portion ot the bone has necrosed, and two weeks ago his physician removed two inches of bone. We find a little suppuration at the ulnar side of the fore-arm, otherwise the wound has remained in a fairly aseptic condition. But at the point mentioned there is a sinus leading down to a cavity which discharges a disagreeable looking fluid consisting of decomposing blood, and what I purpose doing is to anæsthetize the patient and to lay the sinus open and clean out the cavity. There is no union, nor any attempt at union. This is perhaps due to the severity of the accident, detaching the periosteum from the bone, as well as to the presence of suppuration; neither would you expect union to take place in so short a time. In a case of the kind where the bones have separated, you would not expect union to take place before six weeks. It is not absolutely necessary that both ends of the bone be brought directly in contact to insure a union. We have had examples of this kind before us proving this fact. You remember the little boy with the extreme deformity of the shoulder. Although the parts were widely separated, the union between them became perfect. So it will be in this case. It will be impossible to bring the parts together, yet nature will throw out osseous material, and finally the parts will become united, taking, of course, a longer time for the repair. In order to hasten this action we will uncover this outer side and render it aseptic. I find that this does not lead to dead bone, but to a pocket between the skin and muscular tissue. All that is necessary is to lay it open, clean it out thoroughly and pack it to the bottom with iodoform gauze. The fragments will then be immobilized by means of a plaster and a dorsal splint.

Fracture of the Thigh.

This man received a fracture of the thigh six weeks ago. Recently, within two or three weeks, he has begun to complain of pain at the seat of the fracture. Upon examining the case to-day I am satisfied it has gone on to the formation of an abscess. So that we have that condition of fracture of the thigh without external wound of any kind, and yet I am satisfied we shall find quite an accumulation of pus as a result of the injury to the thigh. The repair of the bone has gone on well. In a fracture of the thigh it usually requires ten weeks for the proper union to take place. You notice the presence of symptoms relative to deep seated pus, not as well marked as in some other cases. (Opens abscess just above the knee.) This abscess is best opened by the method long ago given by Hilton; to make incision from the superficial through the deeper tissues by means of a director, and then introduce a pair of forceps into the abscess; his idea being that when you have to divide the deeper tissues you come in contact with the larger blood vessels. By pursuing this course you make your incision through the integument and deep tissue, then use your director, then opening the forceps you tear the tissues without likelihood of injuring the blood vessels, because the blood vessels of the body are above all other structures the least likely to be injured—they apparently keep out of the way. This does not go to the seat of the fracture, so far as I can determine with my finger. Perhaps some of you can explain why this abscess formed without any break of the skin at all—an abscess which formed evidently around the seat of injury to the bone. It certainly could not be from infection from without. The septic material consisting of pus-microbes must have reached the point of injury through the circulation, because there has been no abrasion of the skin. We will thoroughly irrigate the cavity with boric acid, then pack it with iodoform gauze and apply the ordinary antiseptic dressing. This is one of these easy fractures; he broke his leg without expenditure of much force, going down the steps, made a misstep, and broke his thigh. It might be called a spontaneous fracture. We will watch this case with a good deal of interest. It almost indicates some disease of the bone. It may be malignant; it may be syphilitic.

Were it not for the entire absence of symptoms the fracture might be attributed to an osteomyelitis which would in turn account for the occurrence of the abscess.

Fracture of the Thigh due to Sarcoma.

John C., Bohemian, Laborer, Age 29.

This man had the misfortune, seven weeks ago, to fracture his thigh. He is a rather young man, and the force that broke the bone was very slight. A plaster-of-Paris cast was applied and left on for several weeks. When it was removed the thigh presented the appearance that you now see. It is greatly swollen in the region of the great trochanter and is 2½ inches shorter than the thigh of the opposite side. The pain in the thigh is very severe. All this calls your attention to the fact that a malignant disease has been going on in the thigh. The bone has become softened and has broken. The swelling present in the soft tissues is mainly due to the enlargement of blood vessels. So we have here a centrally located osteo-sarcoma of the femur of rapid growth. What can we do for it? The man's fate is sealed. There is but one thing that can be done for him, and that would relieve him for a short time only, that is amputation of the thigh at the hip-joint. With the slight chances in the case, one is scarcely justified in advising such a radical procedure.

The patient's pain should be controlled by the use of morphine and he should be placed upon a warm water bed in order to prevent the occurrence of bed sores.

Metostatic tumors will occur in some of the important organs and will destroy the patient's life in a comparatively short time.

SYPHILITIC OSTEITIS.

Willie, 642 S. Park Ave., age 5½ years, American.

Here is an interesting case. This boy's little toe turns upward and inward over the fourth toe. This is a congenital deformity which annoys the child on account of pressure from the shoe. A year ago the boy had some sickness by which he became blind. Ten months ago this enlargement on his external malleolus began. The enlargement affects the entire thickness of the fibula and extends upward a distance of three inches. It is not tender anywhere except at the most superficial point of the bone. It is semi-elastic to the touch. I am inclined to believe that it is a specific trouble, because of the eye affection and the absence of tubercular or osteomyelitic symptoms. It is not osteomyelitis for it is not sufficiently inflamed nor painful. Neither is it tubercular in character for it is not localized but extends up the leg a short distance. On the other hand it has all of the characteristics of a syphilitic gumma. Always be on your guard for specific trouble. Many times you can get at the truth of the trouble without difficulty; but when you cannot you can often satisfy your mind from the occupation of the patient, present and past. For instance, if he has been a soldier, a sailor, a fireman or a traveling salesman you would not be surprised of a specific trouble.

We will place this patient under antisyphilitic treatment. It is often necessary to institute this form of treatment for the purpose of making a different diagnosis.

OSTEOMYELITIS OF TIBIA.

SINUS—This woman fell and injured herself. There came acute inflammation in the leg, followed by redness, which finally opened and since then has been a running sinus. She was operated upon and some portion of the bone removed, but it did not get well, and she is willing to have the operation repeated, or something done. (Cuts.) This is rather an unusual position for the opening lying entirely on the inner side of the tibia, making it unpleasant to reach. We will get rid of the complication in a few minutes. (Chiseling.) Now we get right into the cavity. It requires more of an operation than one would think from an external examination. I hope to get into good solid bone on all sides and not leave any portion of the spongy, soft or diseased bone, or it certainly will not heal. (Scrapes.) That is the best way to get rid of the sinus. This is 1 to 1000 bi-chloride of mercury irrigating fluid; we use it to purify the wound. Now I shall close this by continuous catgut suture and the old sinus will be a very good place to leave as an outlet through which serum or blood escape if the pressure within the cavity is too great. These cavities are sometimes filled with foreign bodies—with aseptic sponges, with strands of catgut, chips of bone, but you have to be very careful about the material used for the purpose of assisting the connective tissue in these cavities, because the more you put into the cavities the greater the likelihood of sepsis. This method is just as good as any other and will succeed just as often, and you need not bother to secure chips or anything else if you operate according to Schede's method.

The following points must be borne in mind if one wishes to succeed in treating bone cavities according to this method. The cavity must be rendered perfectly aseptic. In order to accomplish this a sufficient amount of the involucrum must be chiseled away to permit the removal of all fragments of necrosed bone and the scraping away of all granulation tissue. The sinuses and the surrounding connective tissue must be cut away. The skin is then closed over the cavity in the bone by means of carefully applied tension and coaptation sutures, a small opening is felt preferably at the highest point. A large dressing of iodoform gauze and absorbent cotton is applied and held in position by means of carefully applied bandages. The extremity is held in an elevated position for at least two days.

The Esmarch constrictor is not removed until the dressing has been applied.

OSTEOMYELITIS OF FEMUR.

Clarence D., Wolf Lake, Indiana, Age 15, American, school boy. Family history and previous history good. Diagnosis osteomyelitis.

This young man had an attack of rheumatism about five years ago. He had a high fever and was delirious. The after treatment for a long time was for rheumatism, but of course without the desired results And so we will differ in the diagnosis. You will remember that this mistake is often made, and I do not think that it is a discredit to any physician to make this mistake, for the appearance of rheumatism and osteomyelitis are very similar. Usually in osteomyelitis only one joint is complained of, at most not more than two. In rheumatism the swelling is confined to the joint. In osteomyelitis there is an effort on the part of nature to get rid of the necrosed bone and she is able to do this sometimes by breaking it up and carrying it off with pus. But in many cases nature is unable to get rid of it. You have in this case a very fine specimen of the protruding granulations. This young man has been operated upon before, but has not been relieved. Passing this probe down I come to a denuded bone, but I am sure that I enter a cloaca of this femur. The bone lies without any manifestations of the formation of the usual tissue which surrounds and envelops denuded bone. There is no involucrum. I am now down to the sharp bone, and I do not go into the cloaca of the bone. This is in a very dangerous condition, because, the granulations being hard, this mass of dead bone is constantly pushed downward and forward into the line of the poplitical space. Entering the poplitical space it is in the neighborhood of the poplitical artery which lies near the bone, and it is not infrequent for these spiculæ of bone to be projected against the artery and wear a hole in it. This is one of the causes of the sudden and severe hemorrhage which sometimes occurs, and there is but one thing to do for it, and that is to amputate the limb above tbe seat of injury. I have seen two instances where a small fragment of bone no larger than a grain of wheat entered the artery. One of them died very quickly. In the other case the patient's life was saved by the surgeons doing what I am going to tell you to do for shock, and that is to put the patient into warm water and increase the temperature to 100° F. In removing these sharp fragments you must be careful and not do what I have done, and let one of the sharp points penetrate the finger. Here is a perfect needle of bone which I wish to show you because it is an excellent example of development of bone below this entirely new bone. And I wish to show you this enlargement composed of bone entirely. There are various veins all over the thigh. They are increased in size to compensate for the interrupted deeper return circulation. I am cleaning out the unhealthy granulations. This is your safe guard from all septic causes which are so apt to come on after. I want to be sure that I have this all clear, yet it is a bad case to be sure about. I feel that I do not want to make any more openings; I have no doubt that this will do well. Some of the smaller depressions I will scoop out with the smaller scoop and have it washed out thoroughly and packed with iodoform gauze. I have said so many times that when you undertake a bone operation you should have a great deal of time. Never feel that you are in a hurry, but take all the time you want. I remember a case where a patient had been operated upon three or four times until he had become discouraged and did not go back again. The surgeon who operated upon him was a man of great ability, but the trouble was that he had not taken the necessary amount of time to do an absolutely thorough operation. I took my time to it, taking out all that looked like degenerated tissue, there was nothing left, and in the bottom I found little foci of infection; since the operation the man has gone right along to recovery and the wound has healed, the first time in nine years. It was not because the first man did not know any better, but simply he did not take time.

Thos. W., Galena, Ill., Age, 10, American.

Now this little fellow is a cripple. He cannot stand. Five years ago he was supposed to have acute spinal meningitis. His thigh began to suppurate and an abscess opened. You can see the scar. The opening closed permanently and left the limb flexed and abducted as you see. The other thigh did not terminate so fortunately it went on swelling, forming a number of abscesses. I will show you a sinus which leads down to the body of the femur presently. You will notice the difference between the two thighs. The deformity is due principally to irregularity in the growth of the bone tissue. This is a case of acute osteomyelitis. Here we have the sinus running down to the femur. Passing the probe I find that we had originally an acute osteomyelitis which separated the epiphysis from the diaphysis, and we have a case of necrosis of the bone. Now this is very unfortunate in its position, for you see that it is impossible to apply Esmarch's constrictor.

The hemorrhage must be controlled by the compression of the femoral artery and we will see if we cannot limit the amount of loss of blood in that way. Where the part is situated so that Esmarch's constrictor can be used it is very easy to limit the loss of blood. The cavity can be packed, and the loss will be very slight. You will notice that the thigh is bent upon itself, and I have no doubt that the little fellow tried to walk before the involucrum or the new bone was able to support the body. Always try to be able to diagnose these troubles in their first stages, before the osteomyelitis becomes active. You notice that on the lower, as well as the upper side is a sinus leading to this bone I am chiseling off. Having existed for five years, you would not expect the fragments to be very large for they have been breaking down and have been absorbed or carried away with pus. The great danger in removing fragments here in the popliteal space near the femoral artery is not in cutting the vessel with the knife but with the sharp edge of the bone that you are removing. You should not only prevent injuring your patient with the fragment but yourself. Many a surgeon has had a septic wound from a simple bone like this that has disabled him for weeks and months, and not infrequently a surgeon has lost his life. Now if I can get all the diseased portion away, this shell of bone will shrink and the thigh will come down to about its normal size again. When you are called upon to operate for necrosis and caries remember that when you put your finger in the cavity as I am doing now, you can become infected by a mere scratch from one of these bones. You see that curetting gives a different sound from what it did at first. The cavity is now cleaned out entirely and will go on to recovery without any trouble. Here is a sinus which I desire to clean out. We will not follow out the plan which you have seen us do so often by cutting it freely open, for it would divide too many of the muscles. This sinus is directly in the tract of the sciatic nerve. After all I do not think the patient has lost a great deal of blood. Now if you will study these pieces of bone you will learn what is meant by necrosed bone. Although we worked as fast as we could and lost as little blood as we could, this little fellow is very much shocked by the operation, as we expected he would be.

OSTEOMYELITIS OF TIBIA.

C. G. G., Kerman, Ill., Age 56, American, Farmer.

No doubt you remember that the patient was before you about two months ago, and we did an operation for necrosis at the upper end of the tibia. There was present at the time merely a sinus leading down to the opening in the bone. We put the director in and found its way into the opening in the bone. We uncovered it; there was a great thickening of the tibia at this part; we found the opening in the bone and there was great destruction in the cancellous tissue. At the lower end of the tibia we found a sinus leading downward; we uncovered this by removing the compact tissue and you see that this opened the medullary canal. It was plain to see that infiltration had taken place, for sinuses were to be seen, and we had a beautiful illustration of moderate infection of the medulla by the progression of the microbes downward. The ground of the microbes was so beautifully shown that the appearance was exactly like that of the development in the test tube cultures. So we opened the medullary cavity of the bone and got rid of the microbes by scraping out the bone from one end to the other. The wound, you see, is practically healed. There is nothing but this depression, which will be healed over in a few days. You will frequently meet with these cases and I hope you will not go away from this room without fully considering their importance. This was a case of osteomyelitis of the interior of the bone effecting only the medullary cavity. Just how it was introduced we cannot say. Perhaps a traumatism was the cause of locating an infection at this point, from which the destructive action began and which would have ended in the complete destruction of the bone, had we not interfered by the operation. The ends of the long bones seem to be a favorite place for these lesions to begin. It is supposed that this is due to the peculiar arrangement of the blood vessels about these parts, As they reach the extremities they divide into numerous branches and in that way it is supposed that the slowness of the circulation has something to do with it. Any foreign matter, microbes or otherwise, are more apt to be lodged in a sluggish than in a rapid current. And once located the microbes multiply and infection increases unless nature is able to limit its progress and form a circumscribed abscess by placing a wall of connective tissue around the area of infection. These cases should receive treatment early. You will remember that almost always the patient has symptoms which cause him to believe that he has rheumatism, especially the aching pain at night. But his pain will be confined to one joint, while rheumatism will usually affect more than one. Osteomyelitis is especially liable to affect children, and in its later stages is the most deadly of any disease we have. It is asserted that the patient may die within 24 or 48 hours from its effects without any external manifestations of its seriousness. You are to recognize osteomyelitis by the excessive pain at night, by the oedema at the seat of the disease, by the severe tenderness upon pressure over a circumscribed area, by the age of the patient and by external manipulations.

Notwithstanding that it is the most fatal of diseases in children it is one of the easiest diseases to treat. If treated early you will not only save the child's life but also save his limb.

L. J. B., Lakefield, Minn., Age, 31, German, Harnessmaker.

How long have you had this trouble? 24 years. What did they think the trouble was? They thought it was rheumatism. Did it swell? It swelled up, was very painful and the doctor lanced it. The discharge continued for months. Eight years ago it broke out again. You have heard the history of the case, gentlemen. Eight years ago this opening was made into a rapidly enlarging painful inflammatory swelling of the tibia evacuating quantities of pus, and it has continued as a discharging sinus ever since. This is a case of osteomyelitis and you see how obstinate they become. The thing to do is to expose the tibia. Pass the director down through the sinus to the bone, then follow along its course as a guide in opening the cavity. There is a slow destruction going on at the end of the tibia and before it is cured it will be necessary to open and remove every portion of the diseased cancellous tissue and when this is done he will be practically relieved. But, notwithstanding that you do this and use every precaution in removing all infected tissue and disinfecting the cavity thoroughly you will have cases return for a second operation. If any portion of the diseased tissue is left, it becomes a nucleus from which the disease spreads. I think that I now have this cleaned out. It will be washed and dressed in the usual manner.

OSTEOMYELITIS OF TIBIA FOLLOWING TYPHOID FEVER.

Emma Z., Bollu, St., Chicago. Age, 10, American.

This case before you is a very practical one. It is a sequela of typhoid fever. It is a case that will frequently be met after any pretracted sickness like typhoid fever. The condition of the system after an attack of this kind is such that the pathegenic microbes find their way very readily into the circulation, and in this case have set up an acute osteomyelitis of the tibia. The disease has reached the suppurative stage. We will lay the part open and see the extent of the trouble.

By elevating the limb in this manner, you notice that it soon begins to become pale. The direct circulation is interfered with in this way. Especially is this true if you compress the femoral artery. The return circulation is facilitated by elevating the veins above the level of the heart. We now apply the Esmarch constrictor and make our incision. I find the bone dead and surrounded by an involucrum of new bone which I must chisel away before it is possible to separate or extract the fragment. Now you see me remove a section of necrosed bone the entire calibre of the shaft. It would have taken a very long time for this amount of dead bone to come away in the pus. This cavity will be thoroughly scraped out, relieving it of all granulation tissue, and limiting the progress of the disease. The line of separation is a little above the union of the upper epiphysis with the shaft. An involucrum has already begun to form and this cavity will soon fill and the shaft will be reformed. This case shows you some of the earlier symptoms of this disease. Usually you do not see them here until they have reached the latter stages, You see how important it was that we had the Esmarch bandage applied, for had it not been used, we should have lost as much blood from this amount of granulation as we would from two or three pumps of the femoral artery. Hence you should always use it in such cases. The cavity will be packed with iodoform gauze and permitted to heal from the bottom by granulation. An ordinary dressing of iodoform gauze and absorbent cotton will be applied.

NECROSIS OF BONE FOLLOWING INFLAMMATION OF DEEP FASCIA AND TENDON SHEATHS.

R. H. D., 208 W. Lake St., age 32, Welsh, baker. Family history and previous history good.

You have some trouble with your hand. How long have you had this? Twelve months. How did you hurt it? I was working with a rusty oven door and hurt my hand. It became inflamed at once. People have an idea that the rust on the iron that inflicts the injury is the cause of inflammation. This is not true regarding this alone, but rusty iron is more likely to be covered with dirt and septic microbes than clean polished iron. We call this a deep phlegmonous inflammation. We have a small opening and this deformity which is due to the adherence of the tendons. He cannot close the fingers. This is a frequent result of an inflammation involving the sheaths of the tendons. It has obliterated the wrist-joint. Supination and pronation are the only movements of the joint. I get a great deal of friction in the joint at the articulation of the radius and carpal bones. About the only thing that we can do is to relieve the man of the annoyance and the pus. We can do this by removing the dead bone and degenerated tissue. The wound will be thoroughly disinfected after removing the bone and septic granulation tissue and it will probably heal in a week or ten days. But we cannot restore the original usefulness of the joint. Active and passive motion and massage will be employed after the wound has healed in order to overcome the adhesions as much as possible.

OSTEOMYELITIS OF CLAVICLE.

This patient, you remember, was before you two or three weeks ago with a tumor at the inner end of the clavicle. It had been diagnosed an aneurism of the aorta, also as a sarcoma. We readily eliminated the diagnosis of aneurism of the aorta because there was no *souffle* or *bruit* in connection with the growth, nor any of the signs. There was quite an enlargement at the inner end of the bone and, as this is not an infrequent seat for the development of sarcoma, we did not know but what it might be a malignant growth of that nature. On laying the mass open, however, and removing a portion of the bone, we found it to be a case of osteomyelitis induced by an injury of some kind. We evacuated the cavity thoroughly, removing a large quantity of granulation tissue and several fragments of dead bone. The cavity was then disinfected, powdered with iodoform and packed with iodoform gauze. It has healed from the bottom by granulation. The patient may now go home perfectly cured.

Osteomyelitis—This young lad last June was suddenly taken while at supper with pain in his great toe on the right side so that he could scarcely walk, and finally the trouble centered itself in the ankle, and his physician finally determined that he had osteomyelitis, occurring in the lower part of the tibia. The size of the lower end of the bone has greatly increased, showing you that an abscess has formed. The boy had chills and fever and was sick for several days. There has been a persistent opening, ever since this time, from which a slight amount of pus is discharged. I have not had opportunity to examine it and determine whether there is diseased bone or not, but am ready to assert that there is, from the history of the case. This is the external opening of the canal left by the abscess through the soft parts (Probes about the ankle, making incisions directly over the center of it.) I go through everything, the integument, the fascia and periosteum, then lift up the tissues with the periosteum, and then the retractors can be introduced and all of them held out of the way. It is well to keep these tissues together—not to separate the integument from the superficial tissues, because if you do, you do not have as firm a covering for the cavity which is left after the operation is finished. (Chiseling in the bone of the tibia above the ankle.) This is new bone forming the involucrum which is frequently very thick and very extensive, but it is necessary to chisel an opening through this bone in order to secure space for removing the sequestrum which it encloses and to place the cavity in a perfectly aseptic condition by curetting and irrigating. A large incision and a free opening into the bone always to be preferred. This bony tissue is infiltrated with the same septic material that produced the original abscess. Here is fully half an inch in thickness of rather recently developed bone, covering over the piece of dead bone, which I have just cut down to. I have now come directly in contact with the seat of the disease, after going through all this tissue, and here we have pus infiltrated through the entire extent of the sequestrated bone. (Uses bone forceps, removing bones.) This is all soft enough for me to break down with my finger. Usually you will find that the disease extends to the extreme end of the enlargement. This operation is of no value unless you remove every particle of infected tissue. Any pockets left anywhere will certainly give rise to trouble. The enlargement goes well over to the fibula on the outer side. There is an opening into the posterior wall. I am opening the posterior surface in order to get at the lining of the cavity which contains innumerable pus microbes. (Cuts away dead skin.) The best way is to cut out the edges of the skin at the mouths of the sinuses. The little loss of tissue is not of much consequence. The periosteum will be drawn over the opening with catgut sutures. A small opening will be left at the upper end as an outlet for blood. The skin is then sutured carefully leaving but a small opening at the upper extremity. The Esmarch contrictor is still in place and will be left until the wound is dressed. This will permit the blood to accumulate slowly in the bone cavity and to coagulate forming a Schede's blood clot. If we have succeeded in rendering this absolutely aseptic this blood clot will soon be filled with embryonic connective tissue cells and soon take upon itself the development of connective tissue, and in this way we save a long process of healing by granulation. The same thing is accomplished by placing foreign bodies in the bone cavity. They answer the same purpose—forming a ladder upon which the permanent tissue is developed. Strands of catgut have been often used for that purpose; chips of decalcified bone put in so as to well fill the cavity are recommended also. The sinking in of the integument at the site of the operation is thus avoided in a measure. It is absolutely necessary to a successful operation that everything should be perfectly aseptic and antiseptic. Usually the periosteum is so thick that there is no difficulty in finding and sewing it separately from the other tissues. Sometimes it is very brittle as we find it here, and retracts, and hence there is difficulty in bringing the edges together. By a second row of sutures the integument is brought together. This case will not be disturbed at all for three weeks.

It is necessary to apply a very large mass of dressing in order to protect the blood clot from injuries. The extremity should be left for a week, higher than the body. After the ordinary dressing is applied it is well to cover the foot or leg with a large mass of cotton batting and in case the disease is near the end of the bone to immobilize the joint by means of splints or by a plaster-of-Paris cast, in order that it shall be absolutely protected.

There is a great advantage over the ordinary way of merely chiseling out the bone and leaving the cavity to heal by granulation.

While formerly these cavities required months and even years to heal completely necessitating dozens or hundreds of dressings, you can by employing the method which I have described achieve the same result in less than one month with but two or three dressings. In this manner you can save your patient a great amount of suffering and expense as well as much loss of time.

HERNIA.

This man has a hernia which cannot be retained, and he comes to us to have an operation performed for its radical cure. I have performed many of these operations before you, but as we have not spoken of the subject of hernia in general during this term we shall do so to-day as we proceed with this case, step by step.

The word hernia means, technically, a sprout or branch, and refers to the protrusion of any viscera of the body. We may have, for instance, hernia of the scrotum, abdomen, lungs, or of the brain. The word usually refers, however, to a protrusion of some of the viscera of the abdominal cavity, and is dependent upon predisposing and exciting causes. One of the predisposing causes is a weakness in any part of the abdominal wall. Your anatomical knowledge will tell you that certain parts of the wall are weak, owing to certain openings; and if these openings are not perfectly and positively closed, there are certainly predisposing causes. The situations of these openings are that of the umbilicus, where we have umbilical hernia, and the openings through which the testicles make their descent from the abdominal cavity into the scrotum, these openings being located in the groin, a hernia here is called an inguinal hernia. There is also a track through which the spermatic cord passes from the internal abdominal ring to the external abdominal ring. We say that the internal abdominal ring is situated half way between the spine of the pubes and the anterior superior spine of the ilium, and about a half inch above Poupart's ligament in the transversalis fascia; and that the external abdominal ring is a division of the external oblique muscle just above and external to the spine of the pubes. When a portion of the omentum or intestine enters this canal it forms an oblique inguinal hernia. If the sac enters the internal abdominal ring and passes down the canal, and protrudes from the external abdominal ring, we call it a complete oblique inguinal hernia; it may extend down into the scrotum, then it is a scrotal hernia. If the sac simply enters the internal abdominal ring, it is termed an incomplete inguinal hernia. When the protrusion makes its way through the abdominal wall and the external ring, it is called a direct inguinal hernia.

There is still another opening in the abdominal wall for the exit of the femoral artery; you remember the small triangle between Poupart's and Gimbernat's ligaments, through which the femoral artery and vein pass. And you remember that the small opening between the femoral vein and the inner wall of the femoral sheath is termed the femoral canal, and the upper opening is called the femoral ring. When any of the contents of the abdomen enter this canal it forms a femoral hernia. There is another variety of hernia, and that is ventral hernia. This may occur anywhere in the abdominal walls where they have become weakened from any cause. Not infrequently a ventral hernia follows a laparotomy.

Other predisposing causes are numerous, such as ascites or extreme obesity, or traumatism, or anything that distends the walls of the abdomen to a degree that separates the fibres of the muscles. An elongated omentum is one of the most prevalent causes, as is also an elongated mesentery. This omentum is a peculiar thing. I believe it is more apt to get out of a small opening than is water. If there is any omentum over a small opening it will slide through it, it is so soft, smooth and delicate. Recurrence of the hernia may be prevented by removing completely the protruding mass of omentum.

The manner of closing the opening is not of so much importance. Every man has his own method, but that is a secondary matter, so long as you relieve the patient of the predisposing causes. The exciting causes of a hernia, of course, are those which cause sudden or prolonged muscular exertion.

When a hernia is once formed, of what does it consist? It is made up of its coverings and its contents. The contents may be anything in the abdominal cavity, but usually it is a portion of the small intestines in an inguinal or scrotal hernia, and a portion of the large intestine if the hernia is in the upper part of the abdomen. The hernia carries down with it a fold of the peritoneum; this fold is called the sac. In this case the fold was already present. The sac in recent cases is very thin and attenuated, but in old cases the movements bring on a thickening of the sac itself, so that in old hernia the sac is very thick and easily found. In removing a hernial sac the coverings that are divided in an inguinal hernia like this are the skin, superficial fascia, intercolumnar fascia, cremaster muscle, infundibular fascia and the peritoneum. They are apt to be agglutinated together. You will usually have no difficulty in recognizing the sac by its shining appearance, and if there be fluid in it, it will bulge up into the opening when you reach it. It is my opinion that a hernia is never absolutely cured without removing the sac and the protruding omentum in case this is the predisposing cause. In nearly every case we have found an elongated omentum in the sac.

The part of the sac outside the ring is sometimes described as the body, and the constricted portion in the ring itself as the neck.

Again, herniæ are classified as reducible and irreducible. A reducible hernia is one that can be readily returned into the abdominal cavity by slight pressure or by position, in elevating the hips, flexing the thighs while the patient lies recumbent. The fact that there is a protrusion is one of the signs of the presence of hernia. By palpation and percussion you get resonance and elicit the fact that it contains air, unless the contents are composed entirely of omentum. Upon attempting to return the contents into the abdominal cavity, the peculiar characteristic gurgling sound is heard. These conditions will enable you to make a diagnosis without difficulty. It can be differentiated from hydrocele because the latter is translucent.

An irreducible hernia is one in which it is impossible to return the mass into the abdominal cavity. Of cource incarcerated herniæ are irreducible. Inflammation may cause an adhesion between the viscera and the sac itself, making it impossible to return the mass; or there may be such a mass of omentum protruding that it cannot be returned. I have operated in cases of incarcerated hernia where I expected to find large adhesions, but found only a peculiar condition of the omentum forming a hard mass that could not be made small enough to pass through the ring, resulting from an inflammation which had existed at a time long past. Any hernia may become strangulated, which means that the gut cannot be returned into the abdominal cavity, that there is an obstacle to the passage of the intestinal contents and that the circulation of the blood through the loop is obstructed; You will be called upon to treat hernia in this condition more frequently than in any other. The symptoms in cases of strangulated hernia are: Obstruction of bowels, a tumor in the situation of the weakened portion of the abdomen, tender to the touch, and tympanitic on percussion. If it has existed for some time, there will, perhaps, be some redness of the skin. The patient is suddenly attacked with persistent nausea, accompanied by colicky pains; at the same time his or her attention may be attracted to the situation of the tumor. This nausea increases from hour to hour, until it gives rise to vomiting, and the pain in the intestine increases. The contents of the lower bowels are passed, pain and tenesmus continue, but no further discharge is effected, this condition of affairs existing until the strangulation is relieved. A cold sweat breaks out over the body; there will be a rapid and correspondingly weakened pulse; the vomiting will increase, and will have a peculiar characteristic faecal odor, and will attract your attention.

Always be suspicious of a case of persistent vomiting, no matter what its history may be. You should therefore carefully examine all of the openings through which a hernia may protrude. It does not take a tumor as arge as one's fist to produce vomiting and the colicky pains accompanying a hernia. A small knuckle of intestine is sufficient to produce all of the symptoms of strangulation. You may be able, sometimes, to reduce a strangulated hernia by taxis, without putting your patient to sleep, but those cases are very simple in character, and are not true strangulations. The latter hernia usually requires an operative procedure. You should secure the consent of your patient to be put to sleep, and in case taxis under the anæsthetic should prove ineffectual, to submit to the radical steps necessary to effect a cure. In making an examination, the sac is manipulated to the best advantage, with the patient's thighs semi-flexed and abducted, the patient lying on his back on a table with its foot considerably elevated. By placing the patient in this position, and by gentle, gradual pressure on the tumor, you ascertain the direction of the sac, and if this pressure is continued, gas will escape with a perceptible sound. It is my rule not to resort to taxis longer than ten minutes, and if it is a strangulation that has come on within the last twenty-four hours, not to try taxis at all, but to proceed with the operation for a radical cure at once. In many cases in which I have seen taxis resorted to in recent cases, the intestine has been destroyed. The results are not so serious in cases of old hernia. But in this day of aseptic surgery the thing to do is to lay the parts open, and not only relieve the patient of the strangulation for the present, but permanently. When you prepare to operate for hernia the first time, I have no doubt but that you will have the operation well mapped out in your minds, and will have a perfect mental picture of the different tissues, and their different characteristic colors and appearances. This is right and proper; but after you have cut through the skin and the superficial fascia there will be some hemorrhage, and you will not be able to distinguish between the different coverings of the hernia. The thing to look for is the sac. It will be very easy to detect by its shiny, glistening appearance. When you have made an opening it will inform you of its presence by a protruding mass, which you cannot help but see. If the hernia has been down any considerable length of time, the gut may change to a dark color, from sloughing or gangrene.

I had a case of herniotomy, a few days ago, in a large, fleshy female patient. It was a strangulated femoral hernia, requiring an operation. On opening the sac, a mass of dark-colored contents popped out. You remember that I told you that the contents of a hernial sac might be any of the movable viscera of the abdominal cavity, and an examination of this mass proved to be the vermiform appendix in a gangrenous condition. You can readily see that if I had not opened the sac and removed the diseased appendix, but had returned it into the abdominal cavity, that bad results would have followed. So I advise you to open the sac in all of these cases. When the sac is opened, serum will flow out of it. This is very valuable to you, indicating by its color and odor the condition of the contents of the sac, and thus showing whether or not they are in a condition to be returned into the abdominal cavity. The strangulation may cause the contents to be very dark in color—even to blackness—without the presence of putrefaction; and so long as it is not of the grayish, dusky appearance, the best place for it is inside the peritoneal cavity, provided the surface is smooth and unbroken. I have done this many times, and have no cause for regret. If the intestine is of the appearance described, showing that it is dead and consequently unfit to be returned into the peritoneal cavity, I take a long piece of iodoform gauze and pass it to the intestine at the bottom of the sac, and thus make a communication with the outside world, which will gradually become an artificial anus. Some authors advise that the sac be opened, and the intestine be pulled down and resected. My advice is not to try to pull the intestine down but to leave it alone. If you disturb the patient in this way, he is apt to do badly.

CASE I. N. H. L., Wis., age 48, American, hardware dealer.

We have here a case of inguinal hernia; it cannot be retained, is a source of continual annoyance to the patient, and gives rise to some pain. So he desires to have an attempt made to close the canal through which it protrudes. It is similar to one of the first that you will be called upon to perform some cold winter night, after a ride through the woods and prairies to a distance of twenty miles, with no assistants, perhaps, but a physician friend, to relieve what is termed a strangulated hernia—one that has existed for some time. A portion of the intestinal tube has passed into the canal, become strangulated, and some such operation as we are about to do here will be required. The first incision, four inches in length, passes through the skin and superficial fascia directly over the inguinal canal. You now see the inter-columnar fascia, which we take up between forceps and carefully separate. We have made a small opening in the sac, no larger than a pinhead, out of which the omentum is beginning to protrude. A mass as large as a filbert has already protruded, illustrating what I have told you, that the omentum is more apt to pass through a small opening than water. We are now down upon the omentum; all that remains to be done is to transfix it with a needle,threaded with a double silk ligature, tie in halves, remove the surplus omentum, and return the stump into the abdominal cavity, then, having dissected out the sac at a point beyond the internal abdominal ring, tie it in halves, by transfixion at the ring with a double catgut ligature, and remove the portion beyond this.

That omentum did not return, and it may be that there is an adhesion holding it. I shall dissect around it carefully before relieving it, for you know that the success in these cases depends greatly upon whether or not you remove the omentum? If you do not remove it, but return it into the abdominal cavity, your hernia is very likely to return. The omentum is apt to find its way into some irregularity through the peritoneum. We will ligate this omentum in halves as high up into the abdominal ring as we can conveniently, using care that the needle does not penetrate any blood vessels. After tying the omentum in halves, we leave one ligature uncut, and with it tie the omentum as a whole. Be very careful to tie the ligatures firmly, because if they should come off in the abdominal cavity there would be very profuse hemorrhage. In dividing the omentum, be sure to divide it far enough away from the ligature so as not to allow it to slip over the end of the stump. When returning the latter into the abdomen use care in returning it as a whole, thus avoiding a loosening of the ligature. Another point of much importance is to include all of the parts of the omentum in the ligature.

The next step is to remove the sac from the cord. We shall have some difficulty in doing this, but still it must be done, and I think that we shall be able to make the separation without doing any injury to the tissues. I now have the entire sac dissected off, and will follow it into the abdominal ring, being sure that it is entirely empty, by passing my finger into it before tying it. I shall cut the fibres along this ring a little more, so as to induce the formation of a greater amount of cicatricial tissue. You remember that in the case which returned, the operation was not a success, because I had failed to reach the internal abdominal ring when dissecting out the sac. A little accident has happened here which is very likely to occur if you are not very careful, and it will make trouble. It is a tearing of the sac at the point where the ligature passes through it, and as a consequence it is not all contained in the grasp of the ligature.

In order to overcome this difficulty I will dissect up the sac to a point a little beyond the tear, and once more transfix it with a needle armed with a double catgut ligature. This ligature is tied securely, the sac is severed half an inch in front, permitting the stump to retract into the peritoneal cavity.

In sewing up the wound, place your finger beneath the tissues which you are to bring together. You are enabled by so doing to keep back all structures from the needle and thus prevent injury. You begin bringing the tissues together at the upper end of the inguinal canal, being careful not to wound the spermatic veins and the deep epigastric artery. The latter, you know, takes its course across the upper portion of the wound and might easily be injured by the needle, and give rise to profuse hemorrhage. You will be able to detect its presence by its pulsations.

You notice that in this case we make no provision for drainage but close the wound entirely by means of the stairway suture, using fine catgut for our suturing material and applying three rows of sutures. We will bring the wound together the same as we do any other wound about the body, taking special care to keep the spermatic cord out of the line of the suture.

The spermatic veins are somewhat enlarged, and you readily see the cause in the pressure made by the truss which he has been wearing and which interfered with the return circulation.

VENTRAL HERNIA.

Case 2. William P., Stark, Ill., age 48, American, farmer.

We have here a very interesting case. This man was wounded in the army in '62 by being struck with an ax in the side, producing a large wound through which the intestines passed, but which the patient caught and immediately returned to the abdominal cavity. You can see the extent of this serious injury.

The ventral hernia which you see here appeared immediately after his recovery from this injury. Notwithstanding all this, the patient was able to return to duty inside of three months.

By gently and slowly compressing the mass of intestines which are contained in the hernia, I am able to return them into the abdominal cavity, and I can feel the small, round opening through which they have protruded. This difficulty is not infrequently a sequelæ of a laparotomy; indeed, this was an unintentional laparotomy. I have seen them much larger than this and also much smaller. It is a trouble, therefore, which you will look upon as a result of a division of the abdominal walls. Hence the necessity for you to use the greatest care in approximating the edges of the wound and in retaining them until firm union has taken place, thereby preventing such accidents.

I do not know what the man's object is in coming here, but imagine that he wishes to know if we can do anything for him. I will say to him that in all probability an operation will help him. We would proceed the same as with a hernia in any portion of the body; we would open the sac and return the intestines; then carefully dissect out the sac and remove it and freshen the edges at the opening through which the hernia escaped sufficiently to expose the different important layers of the abdominal wall, especially the deep fasia. After introducing deep silk sutures, grasping all of these layers, a row of sutures is applied to unite the peritoneum. The deep stitches are then tied, and you have quite as favorable conditions as are present after an ordinary laparotomy. In order to prevent tension upon the stitches, broad adhesive straps are applied over the dressing.

It is a source of a good deal of distress and annoyance to him, and should be treated in this way. A good, hard, well-fitting pad may retain it, protect it, and prevent its further development, It must be a convex pad, any bandage similar to this which he is wearing will not be of any service, but will be rather harmful by causing an irritation over the surface.

Case 3.—Hernia in an infant. James S., 360 Van Buren Street, age 2 months, Irish.

This little boy is brought to us with a lump in the scrotum. It becomes larger when the child cries and smaller when he is quiet. The mass comes down as a protrusion from the abdominal cavity. The boy has a double inguinal hernia. Upon reducing the hernia the sensation of gurgling is plain. The openings are free and the return of the contents of the scrotum into the abdominal cavity is very easily made. The baby has another trouble. The prepuce is adherent to the glans penis, and it is attached all the way around. We can relieve this without any trouble by separating it by use of the probe. This should always be done when there is any tendency toward hernia, as the additional abdominal pressure required in urinating in cases complicated with phimosis increases the hernia. Having now made the separation, I shall oil the glans with vaseline and shall direct this to be applied every day until the parts are healed. What I should advise in this case is to get a truss made that will fit so small a child, but perhaps it cannot be done for a while until the child gets larger. The mother nurses the child every time it cries, which is a bad thing for the baby. She should nurse it only three times a day and twice at night, and then in a month or two, if the child is able, to have the radical operation, we can be certain of a permanent recovery. The sac will get greater and greater until this is done unless the hernia can be retained.

Experience has shown that in a vast majority of cases of hernia in infants the simple use of a truss worn night and day will be followed by a permanent cure of the affection.

PHYMOSIS.

This little patient has an elongated prepuce with a contracted orifice requiring circumsion. It is a simple operation, but is one that should be done in the right way; care must be taken to remove the right amount. The opening in this case is no larger than an ordinary sewing needle, and when the child tries to urinate it causes what we call a balooning. It has been said that this gives rise to all manner of deformities. Not long ago it was discussed in the medical journals as to whether the presence of a tight foreskin was not the cause of hip-joint disease. One physician went so far as to say that the majority of cases were due to a tight foreskin. Of course this was an absurdity, because you see as many females with hip-joint disease as males. There are many patients suffering from nervous disorders that this trouble does aggravate; and hence when you have a case of nervous irritation that does not respond to the usual treatment, it is well to examine the prepuce if it is a male child, and see if it is constricted so that it cannot be retracted over the glans. If you take off too much, the elasticity of the skin will cause it to retract too far, and will expose the glans penis too much. You will see in this case in a few minutes why it is a good thing to advise an operation. You see here a very offensive sebaceous secretion between the prepuce and the glans penis. You will sometimes find that the foreskin is so intimately adherent that it is with much difficulty separated; it is so in this case. You see that I have grasped the prepuce, and I introduce the director between it and the glans penis, and then make a slit as high as the corona of the glans. Reflecting the skin back, I find a very firm adhesion, one that will require quite a little force to separate. Quite a quantity of sebaceous matter now presents itself, foul in odor, and sufficient to produce external irritation.

Circumcision is not only necessary to relieve this irritation, but to keep the parts clean for all time to come. If you do not take enough off the first time you will have to make the second operation. You see that I have separated the reflected portion of the prepuce from the glans, having turned it back, and have an even free margin. It is my plan to pick up the edges of the prepuce and to make a circular cut along the margin of the mucous membrane so that it will easily come in contact with the retracted portion of the skin. I do not anticipate any trouble from hemorrhage in this child; but in older people you must remember that the integument about the glans is very loose indeed, and vessels bleed very freely, not having any firm tissue in which to retract, hence it is necessary for you to pick up all of the vessel . I have seen a man rendered helpless from the loss of blood from a simple operation of this kind, and it was some time before the hemorrhage could be stopped, because the tissues had become so softened and distended with blood that the vessels could not be found. I have adopted the plan of sewing the reflected mucous portion of the skin to the edges of the skin proper, usually with continuous catgut suture, being careful not to draw the stitches too tightly. I think you are always repaid by taking your time and carefully approximating the edges ot the skin. There is then no pain from the dressings. There is also likely to be a clinging of the dressing to the interrupted sutures, and consequently pain; you never lose anything by being careful about these little points. There is another condition in which I think it is well to look after the condition of the prepuce, and that is where there is a tendency towards congenital hernia. This condition is sufficient to assist in the formation of a hernia by the straining that takes place. Of course this is not sufficient to cause a hernia, but it will assist the pre-disposing condition which already exists, at every act of micturition, in the same manner that a stone in the bladder will assist in bringing about a hernia. And you will find many times in your practice that a patient with a hernia has a stone in the bladder; and on removing the stone the hernia has a disposition to be retained without any trouble. All the dressing that this will need is a little iodoform gauze rendered quite soft with vaseline and a little dusting of iodoform externally over the surface.

This dressing will be renewed daily.

EXSTROPHY OF BLADDER.

Harry, Chicago, Ill., age 10, American.

You recognize this little patient as being the one on whom we operated, doing a plastic operation for exstrophy of the bladder, a month ago. We carried an incision around the margin of the defect and about half an inch from this margin. Then we dissected up a loose flap and inverted it after replacing the protruding bladder and holding the latter in place by means of an iodoform gauze tampan.

The edges of this flap were then united carefully with fine catgut stitches which were not allowed to enter the bladder. On each side of the raw surface formed in this manner a large skin flap was dissected up and its edges were united with silk sutures. A dressing was applied over this and supported with rubber adhesive straps which also served the purpose of supporting the flaps.

The operation has succeeded completely. The walls of the bladder can not be seen at all now; the flaps have completely covered the opening except the little strip at the top where there is some granulation tissue· The little fellow runs about the hospital perfectly well, but he has a little dribbling of urine. I shall not try to make a new penis for him to-day, this will be done later on and a new urethra will be made so that he will be able to wear a rubber receptacle in which to collect his urine. What I shall do to-day is to freshion the edges of the upper ununited portion and unite them and there is no reason why this should not prove successful, If you remember the case when you first saw it, there was a very great protrusion of the wall of the bladder. The opening has been contracting constantly and finally no doubt we shall be able to make a perfect success of the case. With one more operation I think that we shall have accomplished all that we intended to or can. The penis, in this instance, is deficient in its corpora cavernosa and as there is no other tissue which may be converted into erectile tissue, this part of the operation would most probably not succeed in producing a very satisfactory organ.

CLUB FOOT.

Jos. R., Milwaukee, Wis., age 19, clerk in coal office.

Gentlemen, this is the most interesting case of club foot that I have ever seen, he came here about a year ago with his feet in the worst possible condition. When he was brought here the soles of his feet looked upwards, so that they were directed toward the inside of the tibiæ; he walked on the outer side of the dorsum of the feet greatly foreshortened. There was, moreover. a shortening of the tendo-Achillis. This variety of club foot is technically termed talipes-equino-varus. You notice that this right foot is almost in a normal position. The toes are nearly straight, and the man walks on this foot with a considerable degree of certainty, and is able to be about his business. The left foot did not do so well. I tore through the skin and tissues in straightening it. We dressed it properly and it went on to recovery. There never was a greater degree of deformity than that of this man, and I look upon his recovery as the climax in the treatment of talipes. No one would have believed that a cure for him was possible.

This case illustrates to you what is possible in such cases. The man had a pair of boots made and is now able to walk about and attend to his business. Now those of you near by can hear the bones crack as I straighten this foot, and you must make enough pressure to make them give way. Of course you will try to avoid breaking the skin. Here you can see bursae on the side of the foot a little below the ankle upon which he walked.

It is probable that we shall have to open the foot and remove this bony projection. Now this right foot is perfect, but with this one I expect to have some trouble. The tissues are cicatricial, and I should not be surprised if they were to tear open again. In this case nature must develop the foot; it is deficient from want of use. The toes will be separated with cotton, and the plaster-of-Paris cast will be applied down to the ends of the toes If you do not have the toes separated and the cast well padded, it will cause irritation, for you will find a puffy projection in the opening you have made which will be more troublesome than the original tightness.

Always make a new cast in these cases. Now I hope that I have impressed you with the importance of this method of breaking club feet. You will remember that the trouble exists from birth, and that the changes you find were months or years in being produced and the thing for you to do is to break up the ligaments and keep the foot in the proper position until nature has filled up the vacant places and fixed the bones in their new position. It is surprising how soon they will fill up. If you do not get the position perfect the first time, you must repeat the operation. Probably the best way is to repeat the breaking up at weekly intervals until the position of the foot is perfect as possible, and then leave permanent casts on for about a year.

CLUB FOOT.

Let me see you walk,my lad. You walk very well do you not? Yes, sir.

This little boy nine years old is one of our cases of club foot. He has been coming here for treatment for seven or eight months. You can see the old bursæ on which he once walked. The feet are in a good condition and he walks upon the soles and I think that if we were to apply a silicate of sodium cast and direct him to wear it for two months it would do then to break them again. I should rather treat these cases that have never before been treated, for after the foot has once been broken down an agglutination of the parts takes place from the cicatricial tissue which is formed. Seven months is a comparatively short time for attaining the good results which you see in this boy's feet and which will be still better later on.

The advantage of this method is that it is perfectly reliable and you can depend on its cure. It is perfectly safe; there is no danger of injuring the patient, provided you do a thoroughly aseptic operation, and in the end it makes a better foot. Of course there are other methods having for their object the overcoming of the contraction of the tendons and fasciæ. If the case is talipes *equinus*, the tendo-Achilles is divided; if talipes *varus*, the muscles, ligaments and fasciæ are divided on the contracted side. But if you resort to these methods you must have your patient constantly under your observation and in many cases the deformity returns, failing to effect a cure after the tendons have been severed. There is another method which has been advocated by a few, and that is an excision of a wedge-shaped piece from the outer side the convex portion of the tarsus large enough to overcome the deformity when the edges of the wound are approximated; the foot is then held in this position by means of a plaster cast until the adhesions take place. You will always be careful not to introduce any septic material in these operations. If sepsis occurs not only the foot of the patient is in danger but his life as well. Taking every thing into consideration I am satisfied that the method which we adopt is the best one that can be used. You will remember that the cast must go above the knee and come down to the ends of the toes. If the cast is damaged or if swelling takes place, you will remove it and apply a new one. As far as padding is concerned, we do not pad the casts except a very little over the prominences of the ankle. The objection to plaster-of-Paris casts is that they are too heavy. I think that in the future I shall use the silicate of sodium casts instead. The greater objection to using the liquid glass is that it is so long in hardening. If it is held in position until it hardens it will hold the foot in place as well as the plaster-of-Paris cast. There is a trick in holding the foot when applying a cast. It should be held firmly so that the pressure of one hand will have a tendency to make a depression in the bottom of the foot. I have had but little trouble in treating club foot except in young children where the feet are so soft and where you do not get the prominence of the os calsis and that of the knee, and when the little fellow kicks about a good deal you find that the cast has become loosened. I think this trouble might be overcome by the use of the silicate of sodium cast as it can be more perfectly fitted to the limb.

Talipes in an Infant.

You see this little baby comes with a talipes varus. There is not much tendency toward a contraction of the tendo-Achilles. This is a case very easily cured by the use of forcibly correcting the position and then maintaining it with a carefully applied plaster-of-Paris or silicate of soda casts, if you are not afraid of it. I have heard from gentlemen that there is no benefit to be derived from this treatment, that it failed for them. Any surgeon can succeed if he has ordinary strength and will hold the parts in place after breaking them up. I know that by this method you can absolutely cure the patient. The foot is put a little beyond its normal position. I would rather wait until the baby can get about. It is an advantage to have them use the limb and stimulate the growth of the tissues in the new position. Another disadvantage in operating on a small child like this is that it soils the casts and you are obliged to change them frequently. Once in a while when you break the adhesions suddenly you lacerate the tissues directly down to the bone. This accident has occurred to us but it does no special harm. Of course the thing to do is to make the surface of the foot thoroughly aseptic, and have your hands and those of the assistants and the instruments aseptic before commencing the operation and then if you make a wound it will be an aseptic one. The tendo-Achilles can be divided in this case when the cast is applied for the last time. You see that the foot is put a little beyond the normal position and we now have a very pretty little foot. There is no doubt but that great good can be accomplished by early treatment with starch bandages and silicate of sodium put on as soon as the deformity is noticed in the child. But the best effects are obtained when the child is able to get up on its feet and to walk about after the cast has been applied.

Ulcer Over the Elbow-Joint.

Case I.—Neal O.. 276 Aberdeen St., American, age 23.

This young man comes with an ulcer on the elbow which is the result of an accident. A large amount of flesh was destroyed, and the process of healing has gone on as far as it is possible by the method of cicatrization and marginal epidermization. He comes to see if we can heal this ulcer for him. I am quite sure that there is no external application in the form of medicines that will heal it. Perhaps an incision on either side would enable it to be drawn together and thus healed. This is a plan which is sometimes adopted, but in this position it is not practicable. The arm must be held perfectly still by a splint and the best method of treatment is to heal it by transplanting skin upon the surface by the Thiersch method, which we will proceed to do. We also see an evidence that the wound is quite deep for the man has a fixed contraction of his fingers. It is impossible for him to extend these fingers and the action can not be restored for the function of the muscles has been destroyed to that extent.

The wound is in an excellent position, as is also the part from which we shall remove the grafts, for you to see the entire procedure. Although the surface is small, the lesson will teach you as much as if it covered yards. You remember that this method not only applies to small areas, but to large ones as well. Large areas may be transplanted in this way after removal of large tumors implicating the overlying skin and necessitating its removal. It is also especially valuable in the treatment of ulcers after severe burns. The operation may be carried on indefinitely. The surface of the ulcer must be thoroughly relieved of its granulations for the reason that they do not possess vitality in themselves sufficient to support the skin grafts transplanted. It is always well to wait a little after scraping off the granulations, and make pressure on the surface to stay the hemorrhage, although you remember in the case of the woman on whose wrist we applied the grafts, for want of time, before the hemorrhage was stayed, the grafts became adherent to the open mouthed vessels, stopped the bleeding and grew successfully. It is well enough to cut quite a thin pellicle of skin for it does as well and perhaps better than the thicker layers, and the wound thus made heals much more rapidly and leaves no scar.

It is to be remembered that the best cut is made with little saw-like motions to the razor, the surface of the skin being held tensely by an assistant. This is a little point, but an important one. The skin should be kept moist with a normal salt solution. The ribbon of skin will then accumulate upon the razor to any length desired. One can easily cut strips ¾ inch wide and from 4 to 6 inches long. These grafts are applied by placing the edges of the razor upon the surface to be covered holding the end of the graft with a needle and sliding the razor from under the skin over the surface. The portion of the graft can later be adjusted by means of needles or fine probes. If the edges roll under, a little lateral motion will unfold them.

As I have said, it is very necessary that some appliance be used to prevent motion of the limb. It is not sufficient to tell the patient not to move the arm. He may be willing to follow out the minutest detail of your directions, but it is very possible for him to do it, hence, you must fix it with a splint so that he cannot move it. In this case we will apply an anterior splint You know that in grafting skin upon the eyelids for the correction of ectropion they were stitched together to keep them immobile. This operation is a very simple procedure and one that will give good results. There is no simple operation in surgery that will give you better results. You remember the man who had lost all of the skin from the anterior surface of the knee, and which we transplanted. The result was perfect and the motion, the patient said, was better after the operation than it was before The surface after transplantation, although not covered with perfect skin, is much firmer, more pliable and better in every way than when covered with scar tissue.

In this operation it is again of the greatest importance to have the tissues in a perfectly aseptic condition. It is well to treat the ulcer for about a week previous to the operation. A large wet dressing of 2 per cent. carbolic acid or a saturated solution of acetate of aluminum should be applied to the ulcer after thoroughly cleansing it and its surroundings with soap and water. This should be covered with an impermeable substance like rubber tissue and should be renewed every day for a week. If the granulations are large and soft it is well to touch them with nitrate of silver or with a 95 per cent. solution of carbolic acid and then to reapply the wet dressing.

The surface from which the skin is taken should be thoroughly washed with soap and water and with alcohol and shaved and then a dressing saturated with a 6-1000 solution of salt in water should be applied immediately before the operation.

Much care must be taken in dressing the wound after this operation. It is first covered with strips of Listers protective silk about ⅛ of an inch wide. These are placed side by side with about 1-16 of an inch of space intervening. Then another layer is placed at right angles with the first one giving a sieve like covering, the spaces serving to prevent the escape of any discharge which may occur.

The entire wound is then covered with a piece of aseptic cotton wrung out of a solution of 6-1000 of tablesalt in warm water. This is covered with rubber protective which must not extend beyond the cotton. Then a large flat piece of cotton is applied and the whole dressing held in place with rubber bandages. This dressing is renewed every day or every second day, great care must be exercised to prevent the dressing from moving from side to side because this would displace and destroy the grafts.

Another and less troublesome method of dressing consists in the application of the strips of Listers protective silk as before. Then this is dressed with iodoform or boric acid and over this is placed aseptic cotton and a roller bandage. This is then left in place for ten days. If every thing connected with the operation has been perfectly aseptic the entire surface will be covered with skin. If suppuration has taken place in one point the grafts over the entire surface will usually be destroyed.

SKIN GRAFTING.

The first case I wish to show you, is this gentleman who some time ago received a severe burn of his face and eyes from an explosion of natural gas. As a result of the cicatricial contraction following this burn, he had complete ectropion of both lids in both eyes, so that the lids turned absolutely inside out and remained in that position all the time. He came to me some two or three weeks ago and I have attempted to restore the eyelids to their normal condition by transplantation according to Thiersch's method. I divided the cicatrices above the line of the cartilage, down to the loose tissue, both above and below, then fastened the eyelids together and taking strips of skin from his arm, transplanted them on to each surface. Now, as you see, he can shut his eyes and there is no attempt at eversion of the lids. You all know how difficult it is to control this bad condition of the eyelids by any sort of operation. Not only is the eversion perfectly corrected, but he can control the tears now without difficulty, and with a very slight operation, I have no doubt that the cicatrix at the inner corner of the eye can be remedied. Yon notice that the skin is perfect in every way, very different from the cicatricial tissue.

The next case is this lady, whom I show to you as the best illustration I have yet had of the benefits of this method of treating large sores. She had a large epithelioma on the side of the head that had destroyed the scalp in the area you see. That was entirely removed by the knife, then the surface was destroyed by the cautery so as to be sure, if possible, to get rid of all manifestations of the disease, down, in some places, to the bone, uncovering the tendons of the temporal muscle and taking part of it away. It took some little time for this eschar of the cautery to separate, but as soon as it was clear, healthy-looking granulating surface, the granulations were all scraped off and a transplantation taken from her arm according to Thiersch's method and now you see it is grown over. You can understand that a surface like that covering an area of sixteen square inches could not heal of its own accord in less than months or perhaps years, and here in two weeks it is perfectly healed.

I will review the steps of the operation of skin grafting. The raw surface to be covered by skin grafts having been prepared either by the removal of a growth or scar or by scraping away the granulations on an ulcer is covered with sponges wrung out of a 6-1000 salt solution and compressed for a sufficient time to cause the hemorrhage to cease.

The area from which the grafts are to be taken has been thoroughly cleansed. The skin is drawn tightly over the underlying flesh and moistened with the salt solution at the point from which the graft is to be taken. A very sharp razor is now carried through the superficial layers of the skin by a quick sawing motion, cutting a strip from one half to one and one half inches in width and of any desired length according to the extent of the surface to be covered. The ribbon of skin will collect upon the razor and can be spread upon the surface to be covered by placing the sharp edge of the blade upon this surface, drawing the end of the ribbon down by means of a probe and sliding the razor over the raw surface. The graft can then be carried to any position desired by sliding it with a probe. If the edges are folded under the graft they can easily be spread out by a little latteral motion.

These grafts are placed side by side until the entire surface has been covered.

Strips of Lister's protective silk or guttapercha tissue half an inch in diameter are now placed over the entire surface, leaving a narrow space between the successive strips. These are covered with another series of strips placed at right angles to the first. The small spaces serve the purpose of drainage.

The dressing applied over this may consist of powdered boric acid or iodoform, iodoform gauze and a large amount of borated cotton held in place by bandages.

This dressing is carefully removed on the fourth or fifth day and replaced by a similar one, great care being taken not to disturb the grafts. If the dressings adhere they should be thoroughly loosened by means of gentle irrigation.

Another method of dressing consists in the application of a pad of aseptic cotton wrung out of a salt solution 6-1000. This pad must overlap the margin of the wound about an inch on all sides. It is covered with a piece of rubber protective tissue equal in size, and this entire dressing is covered with a large pad of cotton, all of which is held in position by means of roller bandages. This dressing is changed once in 24 or 48 hours during the first two weeks after the operation. The wound at the point from which the grafts were taken is powdered with iodoform and dressed with iodoform gauze sterilized cotton. This dressing is not removed for three weeks when the wound is entirely healed.

DEFORMITY OF FACE AFTER A BURN.

L. E., Fremont. Iowa, age 26, American, tile ditcher.

The patient before you was severely burned about the face when he was three months of age, producing a marked deformity, especially of the nose. He had some sort of a plastic operation performed by which a flap of skin was turned on to the nose from the forehead. It united, but left an ungainly leech-like appearance as the result. He came to me and I corrected this deformity for him. Now he comes to have his nose straightened. You can see that his nose is very far from being in a straight line. It is drawn over by the cicatricial tissue. We purpose to straighten his nose for him. The operation will require the breaking of the nasal bones from the nasal processes of the superior maxillary bones and from the frontal bone, and the division of the cicatricial tissue, then the nose can be moved to one side and made straight without any difficulty. The patient complains of one nostril being closed, we will try to remedy this at the same time. This bleeding will all stop in a little while. This is all cicatricial tissue that I have to deal with, making the operation more difficult. I shall now sew the inner margin of this wound with deep stitches so as to prevent the nose from being pulled over by the process of cicatrization.

I can do this by fastening the margins of the incision down to the bottom of the wound and this will throw it into the new position, allowing the raw surface on the side to granulate, and we will cover it with a strip of skin later on. You occassionally meet with similar cases, where you are called on to restore a part of the nose or ear. Sometimes a man will come to you with a crescent shaped piece taken out of the ear. If a portion of the top and a portion of the bottom of the ear is left you can repair the ear for him, giving it a very natural appearance. Unless a portion of the ear remains the attempts are likely to fail because you cannot supply the cartilege. Some time ago a man came to me with a portion of the ear gone, but the upper and lower parts were present. He had gone the rounds, surgeons refusing to operate upon him because of the impossibility to supply the cartilege. I took a portion of skin from his neck, twice as wide as the piece to be supplied, doubled it over and sewed it to the ear leaving the skin attached by a broad base to the side of the head. It was left in this condition for two or three weeks; the flap being cut a little at a time until it was entirely loose. If you look at the patient now across the room you cannot tell that he has ever had any trouble with his ear.

CICATRICAL CONTRACTION AFTER A BURN.

THIRD CASE. Wm. H. 1009 Fairfield Ave., age 5 years, German. Family history and previous history both good. Duration of present trouble, four years.

You have heard the history of the case. This little boy burnt his hands when he was about ten months old. He was thrown forward on a red-hot stove and you see the result of cicatricial contraction. On the left side there is a greater deformity, the little finger is down to the palm of the hand. The other fingers are drawn half way down also by cicatricial tissue. The patient comes to us to know if anything can be done to overcome this deformity. The thing to do is to divide the tissues from without inward, avoiding the cutting of nerves, arteries and veins if possible, cut freely enough to absolutely overcome this deformity. Having done this you will have an open wound. If you have been able to do this without causing much bleeding you can proceed to transplant the skin at once by Thiersch's method from the boy's thigh and carefully protect it and I have no doubt that it will be healed in a week. It is necessary that a splint be applied to the back of the hand. It may be made the shape of the hand and the fingers fastened to the lower side of it, Especially will this be a successful operation if you have not been compelled to divide the tendons. This is of course the best way, but there is a method of fixing the arm to the shoulder or any other accessible part of the body and transplanting by a large flap. A flap is dissected up at some point which can be easily reached with the hand in such a position that the surface to be grafted is directed from the body. The flap is left attached at both ends and the hand is shoved beneath the loop thus formed. The lateral margins of the flap are then sewed to the margins of the new wound made in the hand, and after several days or a week when these margins have been united and the base of the flap has adhered to the surface of the new wound, the flap is completely separated. This method is, however, much more troublesome to the patient than the one we are about to apply. In severe burns it is well to transplant skin upon the surface over which it has been destroyed before cicatricial tissue has been formed. The granulations can be scraped away and you can then transplant skin upon the raw surface thus formed by Thiersch's method and you will succeed. There is hardly any other way that this can be done as successfully. You can see that the hand will be much more useful if this is done.

Hare-Lip.

W. J. S., Nixon St., Age 20, American.

This is a case of a badly united harelip. It has been operated upon, I am told, but the union is not good, and the young man comes to me to have the operation repeated. I am inclined to believe that the result will be good in this case on account of the looseness of the lip and from the fact that it has not grown fast to the upper jaw. In many cases the lip has grown fast requiring its dissection from the jaw and making the operation more formidable and troublesome in every way.

In freshening the edges the tenotome is passed through the lip at the upper angle of the defect and carried down on either side removing the entire margin. At the horizontal margin of the lip the incision is not carried through. The flaps thus formed are drawn downward and cut off about one-eighth of an inch from the margin of the lip, a fine silk stitch is passed through the flaps formed in this manner and they are drawn downward to form the central projection of the lip. The lip is then transfixed with three silk worm gut stitches, being careful to have them pierce the mucous membrane on the internal surface very near the margin to prevent inversion.

Traction is made downward on the silk stitch while the other stitches are tied. A few fine silk stitches are applied to the edges of the mucous membrane and the skin in order to secure accurate coaptation. The wound is dressed with iodoform and covered with vaseline. No dressing is applied in order to avoid compression of the flaps. If the lip is short or adherent it is loosened freely by incisions along the upper jaw. This first stitch must be very accurately and carefully placed in order to be sure that you catch the corner of the nose. In introducing the needle through the lip, you must be very careful to see that the mucous membrane has not been retracted from the edge of the incision as it is very likely to be. If it has retracted, then you must turn the lip out in this manner and see that the needle catches it. Be sure that this stitch at the angle of the wound strikes it just at the angle. We have succeeded in getting a very good adjustment of the parts.

I do not advise any apparatus or dressing for the purpose of drawing the lips together after the operation, I avoid the occasion for their use by loosening up the cheek and lip for some distance, so that the parts of the lip slide easily together. The pressure from apparatus or dressing is usually so great that the line of union is interfered with and not infrequently a slough occurs. Another objection to their use is that they form a lodgment for secretions from the nose which is very disagreeable and may give rise to infection of the wound or the stitch holes which invariably spoils the cosmetic result of the operation.

HARE LIP AND CLEFT PALATE.

M. B., 4 weeks of age.

This little baby has not only a hare lip but also a complete cleft of both soft and hard palate. Thomas Smith, of London. taught that the thing to do in these cases is first to close the hare lip. This is advantageous in that it has a tendency to approximate the hard and soft palates so that when the operation for their closure is made there is less to do. The same surgeon also advocated the closure of the soft before closing the hard palate for the same reason. I do not think this necessary. I believe that the first thing to do is to close the hare lip for the reasons already given, and to allow the child to get control of the facial muscles and through exercise cause their development and gain a step toward articulation.

Having closed the hare lip we will advise the parents to bring the child to us again when it is ready to begin to speak or about at the age of three. Then we will close the hard and soft palate. It will be easier to secure a perfect result at that time and the child will learn to speak quite as well as she would if the operation were performed earlier.

CLEFT HARD AND SOFT PALATE.

Sam T., Muskegon, Mich., Age, 6 years.

Here is a complete cleft of the hard and soft palate and lip. All that I purpose to do to-day is merely to loosen the hard palate and wait a week for the restoration of the vitality of the parts before completing the operation. This is a peculiar case in that it is unilateral. I have now loosened the hard palate on either side by making an incision through the mucous membrane along the alveolar process on either side and chiseling loose the palatine process of the superior maxillary bone and the horizontal palate of the palate bone.

I will pack the space of the incision through the soft tissues and the bone along the alveolar process with a little strip of iodoform gauze which will in no way interfere with the vitality of the part, but will stop the bleeding.

This packing will be left in place for one week, during this time the cavity of the mouth and nose will be kept perfectly clean by frequent thorough irrigations with warm salt solution, a teaspoonful to the quart. This will stimulate the circulation in the flaps besides preventing the occurrence of infection.

After the vitality is restored we will freshen the edges, bring them together, and fasten the large flaps with wire passed through the opening in the bone, then we will with four or five silk worm gut stitches unite the soft parts. I have tried a great many ways of closing hard palates and have failed as often as anybody, but I have succeeded best when I do as I have suggested, by separating the hard palate from the alveolar process, then wait a week until its vitality is restored. If you put the parts on a stretch immediately upon making the flaps the circulation is interfered with and the tissues will have a tendency to slough.

The same patient one month later.

CLEFT PALATE HARD AND SOFT.

This is the patient on whom we operated for complete cleft palate. I present him to show you the result of the operation. In this case we were obliged to do a second operation before we succeeded in getting a perfect result. I now remove the silver wire which was introduced at that time. He will kindly go about and let you see the result of the operation. You see the union is perfect and the uvula, although not perfect, is a very good one. I am quite sure if you will take all of the pains I tried to teach you in such cases, that you and your patient will both be perfectly satisfied with your results. There is nothing more disagreeable to the patient than having every one noticing his deformity and hearing many persons remarking about it. And it is certainly very disagreeable to have an opening between the mouth and nose, through which the food is forced and througn which the secretion of the nasal passages may find their way into the mouth.

You will not succeed in the perfect closure of a complete cleft of both the soft and hard palates until you have thoroughly separated the hard palate with a free incision along its alveolar border; you must be able to close the cleft between the halves of the hard palate without causing any tension upon the stitches. This free separation of the hard palate on both sides looks a little cruel, but it is absolutely necessary that it be done and that the parts come together easily in the center.

It is better to do this operation in two stages. The first stage consists in separating the hard palate, not only along the alveolar border, but the hamular process is broken off as well. thus preventing tension on the palate from the tensor palati muscle. The bones are then slid together in the mid line. It is then easy to bring the soft parts together, freshening their edges, and holding them together by sutures carried out to the sides and passed through the openings made by the chisel. Proceeding carefully in this way, you will succeed, in the majority of cases, with the first operation. If you do not succeed the first time you will find that you have not made the bony part of the flap loose enough. That is the reason that we did not succeed the first time in this case. It is well to leave the wire suture in for some time, as we did here, so as to give the wound time to cicatrize and draw down. Now, notwithstanding that this hard palate is complete, and the soft palate is freely movable and plays back and forth perfectly free, this young man has imperfect intonations of the voice. He must begin after this, and be taught to talk in just the same way that you would teach a child to talk. He must be taught the sounds of the letters, their combinations into syllables and syllables into words. In time he will have learned the proper intonations and the operation will then be perfect in its functional result.

SYPHILITIC CLEFT PALATE.

Jno. R., Middleton, Wis., age 33, German, laborer. Family history obscure; previous history fair.

Seven years ago he had what was supposed to be a cancer of the lip, which was healed, and last summer his throat became affected. This subsided under specific treatment but upon stopping, the inflammation recurred more severely than at first.

This man is 33 years of age. For the first year or two he has had some trouble with his throat, developing from the soft palate and the inside of the cheek. The trouble has gone on from bad to worse until the left levator palati muscle is destroyed. You can see that the edges of the wound have healed, and you see the hitch in his speech caused from the deficiency. I have no doubt but that this is a sequela of a specific trouble. It frequently attacks the nose and destroys the bones, and we have a broken down nose. He no doubt has had good treatment which has arrested the disease and we now have the sequelæ, The notch mentioned is large enough for me to lay my thumb into without any difficulty, and this gives the man a peculiar intonation of the voice. He comes to us for relief.

TREATMENT.—We may close the opening by freshening the edges and bringing them together the same as we do for cleft palate. Of course we will not make an operation until we are satisfied that the progress of the disease has ceased. And if the man will come and take increasing doses of a saturated solution of potassium iodide until the wound has healed entirely, we will close the defect for him in the manner we have described.

BRANCHIAL CLEFT.

David W., Pontiac, Ill., age 27, English, shoemaker,

This patient has a small sinus opening on the outer side of the neck. It is congenital. There are long intervals during which it does not inconvenience the patient in the least, then it will become inflamed a few drops of fluid will accumulate which will cause some pains. This fluid will be discharged, and the patient may be comfortable for a considerable time.

Injecting a solution of carbolic acid into the sinus the patient can taste the fluid and it causes him to cough.

I introduce the director and find that it extends upward and down inward, and from the distress and coughing produced, I have no doubt that it extends directly into the oesophagus. It is a very interesting case, and one that will require a good deal of time. The condition is known as a branchial cleft which is a remnant of an embryonic condition. Its treatment is not very satisfactory, because it consists in the complete removal of the lining of this channel, which can be accomplished by dissection or by the use of chemical substances or the actual cautery.

This can be done only with the greatest difficulty on account of its structure and position.

Dog Bite.

This boy was bitten by a dog two months ago; it is rather singular that we should find any irritation in this wound. It does not show that the dog's teeth broke even the cuticle. It is such as would come from a pinch. Two days ago it became tender, which condition was relieved by the application of hot poultices. The mother says that the wound bled at the time of the injury. What shall we do for the wound? It is always best to treat it as if it were a poisoned wound, because it is impossible for you to tell, in a majority of cases, whether the dog is suffering from rabies or not. In some instances there is no doubt but that the dog inflicting the injury was suffering with rabies, but where you do not know you should adopt some plan of external treatment. Suction should be applied to the wound in cases seen early, in that way carry off the virus, if possible, in connection with the blood. We know that a bleeding wound is less likely to be affected by virus than one that is not bleeding. I always adopt the plan of burning out the wound with strong nitric acid. The nitric acid penetrates deeper than anything else. It can be done better with that than with any other caustic unless you make use of the actual cautery. In one case which came to me I adopted the plan of burning out the wound with the cautery. It takes some time for the wound to heal, but it is safer. I do not believe that this child will have any trouble whatever from this difficulty. If it is a little tender I would apply to it gauze saturated with alcohol and hot water. I had in my practice one case of hydrophobia, and perhaps if I tell you the circumstances of that case it will be of service to you, in that it expresses very well the circumstances attending one of these cases. It happened to an old German woman who herded cows on the prairies near this city. She had a dog that went with her. She was totally an unimpressible woman. You could not say at all it was a nervous impression in this case. The dog she had with her for months and months; it stayed in the house with her; she fed it with her hand. One morning she arose and went out to feed the dog, and it sprang up and hit her forehead so as to tear a piece of flesh entirely off. She came to me immediately. I treated it as a lacerated wound by uniting it by means of stitches, bringing the edges accurately together. she came three or four times to see me. It healed. There was no irritation of any kind and she went about her business again with the dog following her and taking care of the cattle. At the end of six weeks I was sent for to see the patient. She was having characteristic hydrophobia spasms, to which she succumbed on the following day. She said that two days before pain had come in the scar. Here we had a case in which there was no nervous trouble at all, and in which there was a period of incubation of six weeks—about the usual time. This boy's mother has been reading of a case of hydrophobia which has appeared in the papers of this city and is alarmed accordingly. Whether Pastuer's treatment will prove sufficient in all cases is a mooted question as yet.

INJURY TO HEAD.

This man was injured by being thrown from a horse which ran over and bruised his head. He has not been sick, sleeps nights, but has a headache sufficient to prevent his attending to his business. He says that it produced a fracture, but did not bleed, that there was a blue spot. He was unconcious two nights and a day. Has no difficulty in moving his arms and legs, and had none after recovering consciousness. Was black about the eyes. He says two weeks after the bruise was made a doctor lanced it here in the occipital region, and scraped the bone. He pronounced it a fracture. The patient has a severe headache about twice a week, which always leaves his head sore to the touch. This is an interesting history, particularly with reference to his assertions that he has severe headaches, and these end up by tenderness coming on at the seat of injury. That calls your attention to the interesting point of nervous irritation following injury to the head. In those cases, if there be present local irritation, the surgical operation is more sure to bring relief than if there is no irritation. In epileptic cases, when the scar becomes tender or red, operation almost invariably gives relief. Where you cannot localize, where they are all general, the operative procedures are not very permanent in their effect. This man gives no history of epileptic forms of convulsions, unless he has had them at night and does not know of it. I should be inclined to refer him to Professor Lyman to afford him some medical relief. If he does not get much relief I am satisfied a free incision over the seat of the injury would be indicated.

TRIFACIAL NEURALGIA.

C. S. M., 129 Dearborn Ave., age 50, American, clerk.

This man has been a great sufferer for many years, having severe pains in the side of the face. He has tried all sorts of remedies supposed to be useful in such cases, and has become an opium eater to some extent, as well as addicted in a measure to the use of alcohol, yet the pain exists. A great many times a day he is compelled to stop work and rub his face vigorously with his hand, and at the same time rub the internal surface of the mouth with his tongue. The pain begins at the mental foramen, and continues to the middle of the lip, giving rise to excruciating suffering throughout this extent. It is a trouble of the inferior dental branch of the inferior maxillary nerve which passes through the inferior dental canal. We purpose to open the canal and remove a section of the nerve. Notwithstanding the fact that the nerve may be dissected out and removed, in these cases it very frequently indeed gives respite from the trouble for a number of years only, when the trouble will be re-established by the reunion of the nerve. A noted German experimenter has demonstrated the fact that he can reproduce the nerve by pursuing a certain course. He makes a division of the nerve and resects a portion of it. The proximal and terminal ends of the nerve are fitted into the respective ends of a tube composed of decalcified bone tissue. In this way the growth of the nerve is stimulated into greater action, the decalcified bone tube acts as a guide for the growing nerve tissue, and the union of the nerve soon becomes complete. This fact explains why these troubles return after the nerve has been resected. The bony foramen in which they are contained direct the growth of the nerve tissue, and the nerve, after the lapse of a number of years, becomes united in the necessary way.

Here is the mental foramen and you can see the nerve coming out of it. The nerve is larger than is normal, and is red in color. You can use the chisel or the trephine in opening down upon the nerve; I prefer the chisel. I shall now take a small piece of this bone and put it in the opening of the mental foramen, plugging it up in this way and thus preventing the reformation of the nerve in the canal. The bone will grow in that situation and form a permanent plug.

Deflected Nasal Septum.

The patient now being anæsthetized is suffering from occlusion of one nostril, resulting from a deflected septum of the nose. We will try to relieve the young man. It is not an operation for class display. In fact the operator himself has trouble in seeing what he wishes to see. In this operation I shall try to make an incision around the base of the septum, and with the elevator remove the mucous membrane to its highest part at the point of deflection, then I shall remove as large a piece of the cartilage as possible at this point. The mucous membrane will then be placed in its normal position, and secured there by means of a few stitches. This is very easy to explain, but it is very difficult to do. The mucous membrane is so very tender that it is almost impossible to separate it from the septum without breaking it. It does not do much harm if this happens, for cases are relieved by breaking away the highest part of the septum even if the mucous membrane has not been perfectly separated.

The nostril is then packed with iodoform gauze in order to prevent infection of the wound, and to keep the nostril open.

The packing is changed every fourth or fifth day until the wound is perfectly healed.

Irritation of Pharynx.

O. M., Michigan, Age 44, German, Farmer.

This gentleman complains of something in his throat. He eats well, but it hurts him to swallow. We will see him drink. (Patient drinks). He has about as good a throat as I have. Does anything come up into your throat or mouth and then fall back? "No, sir." I asked him this question to ascertain whether or not he has a polypus from the pharnyx into the esophagus. By gagging they are thrown into the mouth. I find nothing abnormal, nor do I find any foreign body as far as the finger can reach. I can feel all parts of the pharynx and the great cornua of the hyoid bone and I am inclined to believe that if there is anything in his throat it must be farther down. Sometimes we find a constriction of the esophagus producing these symptoms, so it is well to introduce the esophageal tube. The greatest difficulty that you will meet in passing the tube will arise from the disposition of the patient to hold his breath. You will induce the patient to breathe, then the tube passes without any difficulty. Now this man has had his mind drawn to his throat so long that it has become hyperesthetical. Of course this examination is not complete, and we will have to make a further examination. The patient will be prepared. at a future clinic, by spraying the esophagus with cocaine and in that way he will be able to undergo a rigid examination.

Enlarged Tonsils.

Charles M., 125 W, Madison St., Age 13, American, Schoolboy.

This boy has had a sore throat for a week. His tonsils are very much enlarged and congested, their whole surface is red and angry looking. You know that I do not believe it best to operate on them when they are congested or in an inflamed condition, for you may have profuse hemorrhage and then you frequently have to resort to many means to stop it. The rule with me where the part is inflamed is not to use the tonsillitome at first, but to give the patient an astringent wash, to be used as a gargle, and have him return in a week for the removal of the tonsils. This is what we will advise in this case.

Dupuytren's Fingers.

Mr. Wm. V., Chicago, age 47, English.

This patient shows his hand with the little and ring fingers flexed into the palm of the hand and fixed in that position. When I attempt to extend them and examine the palm of the hand beneath them, I feel very readily a distinct band rise up under the palmar skin. This band is rendered very tense at every attempt at extension of the fingers. On either side of these bands are to be seen several small dimple-like depressions in the skin. This trouble is technically termed a case of Dupuytren's contracted fingers, and is a deformity resulting from injury to the fascia of the hand which produces contraction of the connective tissue in and about the deep fascia. Its tendency to contract, flexes the fingers and holds them immovable in this abnormal position.

The flexor tendons are not primarily concerned. The trouble was named after Prof. Dupuytren because he was the first to accurately describe the pathological conditions.

To overcome this deformity we introduce the tenotome and divide all of these resisting bands met with in succession as the fingers are forcibly extended. This is all done subcutaneously, as you plainly see; the hand in the first place having been rendered positively aseptic. The wounds are dressed with iodoform and iodoform gauze and the fingers bandaged in an extended position to a well padded splint. After two weeks passive motion will be employed every day. The use of the splint must be continued for a number of months in order to prevent recurrence.

SECTION OF FLEXOR TENDON OF HAND.

George H., 545 Fulton St., American, pattern-maker.

This man met with an accident this morning by running a half-inch chisel into the palmar surface of his hand, There was not much bleeding, but the condition which you see followed. The patient has lost the power to flex the middle finger, hence we infer that he has divided the tendon of that finger. We know of no other injury that would produce just these symptoms. You notice that the wound is in rather a fortunate place so far as the hemorrhage is concerned, being a little too high for the palmar arch. Had it been a little lower the hemorrhage would have been considerable.

We will anæsthetize the patient, cleanse the wound thoroughly, lay it open, find the retracted tendon and unite its ends by means of catgut sutures.

The external wound will be closed and the hand will be dressed and splint with the fingers flexed, in order to prevent tension upon the suture tendon.

CRUSHED ARM.

This is another case of accident. This man was caught between the bumpers of two cars, injuring the arm very severely. You can see the great amount of ecchymosis that exists all along the arm and in the axillary space, At the time of the accident two weeks ago the arm was twice its present size, being distended with blood. The little blisters which are so apt to follow an accident of this kind, you see are quite numerous over the surface of the arm. There is no fracture, but the flesh has been shoved away from the bone. I examined the case carefully but I was handicapped by the great distension of the arm. I doubt very much your ability to discover the landmarks of the elbow now, yet it is not more than half as badly swollen as it was then. I was satisfied, however, that it was not a very serious accident, for I found the radial and ulnar arteries beating very nicely. He has been treated by suspending the arm and applying hot fomentations. Of course these little blisters do not amount to anything. They are simply formed from an exudation of serum between the cuticle and the true skin. They can be relieved in a simple way by simply pricking them with a needle, allowing the fluid to run out and then cover with vaseline. After severe crushing injuries of the extremities, the greatest danger aside from septic infection comes from obstruction to return circulation. This can be very materially improved by elevation or suspension of the extremity.

CRUSHED FINGERS.

This man had his fingers crushed by being accidentally caught between the bumpers of the cars when he was coupling them together. As a result he lost two fingers at the first joint, and has a lacerated wound of the first finger. The accident occurred a week ago while the patient was out of the city. This is the first time that I have seen the case. The condition of the hand shows that it has been held in place by adhesive plasters and antiseptic gauze applied. It is better that they were held by plasters than by stitches for that leaves better drainage. I cannot say that it is altogether an aseptic wound, yet it has not resulted in any general or any serious local trouble. And I think this is because there were no stitches introduced. No doubt the hand was covered with dirt and grease and it was impossible to make it aseptic. The free drainage allowed all of the septic material to come away. The surgeon, you see, has left the dorsum of the fingers long to form the flaps. This was right. Had he made anterior flaps, he would have been compelled to go too far back on the hand, making it a far less useful hand than it is now. Never remove the heads of the metacarpal bones from the hands of a laboring man if you can avoid it. It destroys the breadth and usefulness of his hands. In cases of ladies and professional men it makes a more symmetrical appearing hand and may be done. If a case like this came into my office I should wash the hand in oil or benzine or kerosine then in soap and water and get all of the dirt and grease off. Then I should trim away the loose fragments, preserving everything possible, and apply a dressing of iodoform, iodoform gauze and absorbent cotton.

CRUSHED FINGER.

A. M., 824 W. Erie St., age 46, German, mechanic.

You see what has happened in this case. This patient caught his finger between two iron beams, the force being sufficient to tear the pulp of the finger from the bone as far back as the second phalangeal articulation. If this injury were at almost any other portion of the body, instead of being at the end of the finger, it would become gangrenlous. But at the ends of the fingers and toes the tissues, in injuries quite as severe as this retain their vitality. It is to be remembered, then, that you will not be in a hurry to amputate the fingers in such accidents, and especially is this true, if the part bleeds freely, as it does in this case.

We will have this thoroughly washed with soap and warm water and then in a 2½ per cent. carbolic acid solution then dusted with iodoform and iodoform gauze applied. The fragments of tissue will be placed in position as well as possible before the dressing is applied.

It is surprising what recuperative power these extremities possess. When the dressing is removed after a week the part will have adhered and what now looks like a mangled mass will then look like a very fair finger.

Needle in the Hand.

Susan B., 275 Indiana St., American, book-binder.

Well, madam, what is your trouble? (A.) I ran a needle into my finger about five months ago. (Q.) Does it pain you much? (A.) It does very severely down to the bone.

A magnetized article may be suspended by a fine thread and used successfully in locating the remaining portion of a needle in the hand. You may magnetize a needle and suspend it as I have indicated, and then pass the hand about under it until you see the slight movement of a suspended needle toward a certain point in the hand. Of course there is no certainty that there is a needle here, and there is no certain plan of locating it, other than the means which I have mentioned. Dr. Lauenstein, of Hamberg, has tried this method, and has been able to locate the foreign body when there were no symptoms present to indicate its position. This is a simple method, and is worth a trial. Unless you locate the foreign body it is usually impossible to find it, and you are not justified in cutting into a patient's hand for something that you are not likely to get.

We will arrange an apparatus for locating the needle, and will have the young lady come again.

Foreign Body in Foot.

Hugo N., 60 W. 12th St., age 45, German, laborer.

Seven months ago this man was struck on the dorsum of the foot with a pick, since which time there has been a suppurating sinus. We purpose laying it open and seeing if there is not a foreign body at the bottom which keeps the sinus open and discharging. Having laid the wound open I now find a piece of shoe, if not a piece of the pick. You have here a good illustration of a punctured wound, such as that made by a nail or other blunt instrument. It is very similar to what you find resulting from the penetration of a nail through the shoe and stocking. There is no trouble for a few days, and then the foot at the seat of injury begins to swell, it is inflamed, and in a few days it opens spontaneously and discharges its contents as this has done, and leaves a sinus which shows no tendency to heal. Now, you will not allow it to go as long as this has—seven months—until you try to relieve the trouble. You will find the nail has carried a foreign body in with it; in this case the pick carried in a piece of the shoe. In these cases it is always well to enlarge the external opening and look for the foreign body. This also allows the free discharge of the serum, and will prevent the abscess to which I have referred. After an abscess has formed, then by all means lay it widely open, examine it and find the foreign body. If your experience is like mine, there will not a year go by but that you will have cases of this nature, from which you will remove either a piece of the instrument or a piece of the clothing.

Foreign Body in Thigh.

Police officer.

Here we have one of our police officers who was wounded in the Haymarket riot. A bomb-shell burst near him making wounds which left these scars which you see on his back, It is only recently that he has located a bullet in this thigh which he received at the same time. Now, I did not want this man anæsthetized until we had located the bullet. It is not an unfrequent circumstance to have bullets and slugs carried in the body for years. It is often only by getting in the way of some functional organ that they can be found. You see the difficulty in finding this, it is very deeply seated in the flesh. Let him wake up. There is no use in making a cut unless we find the foreign body. When he is awake I am sure the man will find it for us, and it will be a simple operation when he finds it.

Contracted Adductor Tendons of the Thigh·

Arthur L., 1165 Ramsey Ave., Age 17, student, American.

This young man was sick with an attack of spinal meningitis when he was eighteen or twenty months old. This was followed by contraction of the flexer muscles of the leg. He had a well marked talipes equinus which was cured by division of the tendo-Achillis. He complains of having pain with limited motion. When I attempt to abduct the limb this distinct ridge comes up in the groin. So we have a contraction of the adductor muscles. We shall relieve him of this tightness felt in the groin by severing the tendons there. In this vicinity it is wise to not attempt a subcutaneous tenotomy. I consequently make a longitudinal incision through the skin and then cut the tendons transversely being very careful not to advance too rapidly. I do not cut any farther this way for I feel the artery and vein. This is the fascia covering them and it would be dangerous to cut farther.

You see that full abduction can be made now without any difficulty. The wound in the skin and superficial fascia is now closed by means of a continuous catgut suture and the usual dressing applied. This wound should heal by first intention and the patient have no trouble whatever.

SPECIFIC ULCER OF SOFT PALATE.

Mrs. R., North Cape, Wis., Age 43, Norwegian, housewife.

This patient comes to us with a ragged, dirty looking ulcer of the soft palate extending back to the velum. The ulcer is progressing in its development and has a peculiar appearance; the surrounding tissues are undermined hence I have been asking the patient questions leading to a certain diagnosis. She tells me that she has had six children, two of which died in infancy. The disease has been slow in its progress. Of course there are three things which might produce this condition. An epithelioma developed upon the mucous membrane covering the uvula, or the specific trouble to which I have referred, or tuberculosis of the mucous membrane. The ulcer has been long in reaching its present condition and its appearance inclines me to advise anti-syphilitic treatment. It will assist us in making the diagnosis, if nothing more. I am satisfied that the potassium iodide will do her no harm and I think it will be of a good deal of service to her. We will, therefore, advise 15 grains three times a day, also a simple wash to be used as a gargle, such as a solution of boric acid, to keep the mouth clean. We will request her to report in three weeks.

SPECIFIC ULCER OF THE ARM.

Clara D., 276 W. Taylor St., Age 20, American, housewife.

Three months ago this patient first noticed a small pimple on the posterior surface of the forearm, which has gradually increased in size until it has reached the size of a five-cent piece as you see. It is circular in form with slightly undermined edges, is surrounded by a ring of dusky, darkish brown color, with no particular disposition toward progression of the ulcer, nor much tendency to destruction of its center. Another cicatrization shows the location, just below the present ulcer, of a former ulcer supposed to be poisoned from a glove. I am pretty well satisfied, although I cannot say positively, that the case will be relieved by the internal use of large doses of potassium iodide. Circular ulcers having the appearance of being made with a punch and having the persistant discoloration of the skin for some distance about the edges are indicative syphilis.

So far as the ulcer is concerned I am satisfied the best local application is a fomentation of black wash. A piece of lint, doubled in thickness just large enough to cover the ulcer wet in the black wash, then covered with a piece of oiled silk is applied to the ulcer and held in position by a bandage. Once or twice a day the lint is thoroughly moistened with the black wash. This treatment will result in the complete healing of an ulcer as large as the one under consideration within a week or two.

Perineal Fistula of Urethra.

W. J. S., Bloomington, Ill., age 35, American, carpenter.

The patient we were waiting for is the one who was before you a few days ago with a perineal fistula. You remember that I laid the tissues open and scraped the granulation tissue away, and packed the cavity with iodoform gauze, but it has not cured him. Neither did it relieve his cystitis.

The patient gives the history of having experienced several attacks of gonorrhœa which resulted in the formation of a tight urethral stricture. Several months ago an abscess formed below the urethra which was opened and resulted in the fistula under consideration which communicates with the membranous portion of the urethra.

The patient has suffered from a cystitis for over a year but this has been much increased in its severity since the formation of the perineal abscess. All of the pathological conditions present are undoubtedly the result of infection from the gonorrhœa.

Large quantities of ropy muco-pus are discharged with the urine, and the bladder is so irritated that it will hold but a small amount of urine. The patient has no rest, being compelled to evacuate his bladder every few minutes during the night. The trouble has lasted so long that the ordinary operation will not answer the purpose. The introduction of a catheter and washing the bladder out with boric acid solutions does not relieve the irritation, so we purpose to give the bladder complete and absolute rest by doing a perineal section. There are a good many different kinds of instruments on the market for washing the bladder, such as double catheters, etc., but the only way to get the fluid to all parts of the bladder walls is to introduce the catheter, fill the bladder with your antiseptic fluid, allow it to flow out and refill again, repeating the operation until the object is accomplished. In making the perineal section, your assistants should be very careful to hold the staff directly in the center of the perinaem with the convexity of the sound against the perinaem so that you can feel it with your finger. Now placing the blunt end of the lithotomy knife in the groove of the staff, it is carried into the bladder. I find that the walls and neck of the bladder are thick and indurated. The urine will now dribble through a drainage tube to be introduced into the bladder through the opening which I have made, and the bladder will be at rest. You see that there is a large amount of calcarious matter coming out of the bladder now. This rubber drainage tube contains about twenty small openings in the portion placed in the bladder. It reaches to the fundus of that organ and will be left in place and the urine allowed to dribble out until the mucous membrane of the bladder has become normal. In order to prevent the accumulation of phosphates in the drainage tube, the patient will receive ten drops of dilute nitro-muriatic acid in water to drink three times a day, or five grains of boric acid every three hours. The bladder will be irrigated twice a day through the drainage tube with a saturated solution of boric acid in water.

Fistula in Ano.

A. J. J. H., 2973 Cottage Grove Ave., age 41, American, reporter. This patient had an ischia-rectal abscess which was opened two years ago, and a fistulous opening now remains. The abscess, he claims, was opened and thoroughly cleaned out. However, it does not heal, and I think that I detect the reason why. Just on the inner side of the internal sphincter muscle, I find a fistulous opening which I have no doubt runs up along the bowel for some distance just beneath the mucous membrane.

The thing to do is to anæsthetize the patient, dilute the sphincter and open the fistula throughout its entire extent with the scissors. Hence, I call your attention to the necessity in operating for fistula in and or for ischiorectal abscess, of seeking for these offshoots which take a direction up along the bowel, then, having found them all and opened them freely you will not have any such sequelæ as we have in this case.

PERIRECTAL ABSCESS.

Mrs. S. W., 221 E. Ohio St., age 37, American.

This patient had an abscess form along the rectum five years ago, which broke of its own accord, and which, the patient is confident, was in connection with the rectum at that time. She has had several operations for its relief, and comes for advice and an operation if necessary. I have not examined the case yet, but I find a drainage tube extending into the ischio-rectal fossa. Here is a second opening from the posterior surface of the sacrum.

You can now see how serious a simple abscess of this kind may become if it is not properly handled. From the scars present, I am inclined to believe that the incisions have not been large, and the rectum has not been entered in the operations. The abscess cavity was not freely emptied and drained, and the pus was allowed to burrow in various directions. Most frequently, as in this case, the pus burrows upward upon the posterior surface of the sacrum or through the loose connective tissue along the rectum.

Whatever may have been the condition in the past, I do not find an opening in the rectum now. You can see that what might have been a very simple thing at first now proves very serious. I have followed the burrowings to both the dorsal and under surfaces of the sacrum, laying the sinuses widely open, and have gotten to the bottom of it in all directions. The abscess cavities and sinuses are curetted freely, and all the granulations lining them are carefully removed. We will pack them to the bottom with iodoform gauze.

In the early treatment of these cases, make a free opening, and be sure that there will be no burrowing of pus, by keeping the cavity carefully packed to the bottom with iodoform gauze until it is entirely healed. The tissues are so loose that when the burrowing begins in the connective tissues, it continues often directly against the attraction of gravitation, but this is due, no doubt, to the movements of the muscles, all of which should be avoided by an early operation.

Fistula in Ano.

M. H. D., 393 W. 13th St., age 34, American, manufacturer.

The patient before you has been troubled for eighteen months with an abscess in the neighborhood of the rectum.

At repeated intervals the pus collects, discharges itself, and the patient is relieved until the pus collects again, and the cycle is repeated. Just here you see a swelling running out to the ascending ramus of the ischium. It is inflamed, and as I pass my probe under it, I find that it is undermined in all directions. We will lay it open. It is not often that you see a sinus running into the ischio-rectal fossa in this manner. As a rule, the sinus opens in the lower portion of the bowel. Here it opens quite high upon the lateral wall. I will lay the sinus open widely to the bottom, will thoroughly scrape out all of the infected granulation tissue lining these cavities, the pyrogenic membrane of the older authors, pack it to the bottom with iodoform gauze, and let it heal by granulation from the bottom. It will then get well; and it never would get well unless some such operation were performed.

This abscess has existed so long because the sinus is so small that it was only just large enough to allow the contents to be discharged, and so admit gases and foecal matter to keep up an irritation.

Had we seen this patient when this abscess first began, in all probability this fistula could have been avoided. It is probable that it was slow in its progress, provided it was not caused by the protrusion of a fish bone, or some substance of that kind through the bowel; and if it had been laid wide open, the same as you saw me do just now, so that the contents would be freely emptied, a fistula would probably have been avoided. When an abscess does occur, lay the sinus open freely from the ischio-rectal fossa into the bowel, curette thoroughly and pack with iodoform gauze.

H. D., Farragut, Iowa, Age 53, American, farmer.

I have not seen this man, but they say he has a fistula. And I suppose that it means a fistula in ano. The term is commonly used to designate such a fistula, but there is no reason why the term should be referred to this region of the body particularly, as we may have fistulæ in various other regions of the body. You know that fistulæ are formed from abscesses, or from the presence of foreign bodies such as fish-bones injuring or perforating the lining of the rectum causing an infection of the connective tissue surrounding the rectum, which leads to inflammation and the formation of an abscess which upon opening leaves a sinus through which infection continues to take place. In another class of cases a tubercular infection of the mucous lining of the bowel takes place and when this perforates the intestinal wall infection of the surrounding tissues occurs as before. Always examine the opening carefully for the foreign body. Examine early in the history of the case and discover if there is any fluctuation. By an early examination and treatment you will avoid the sequelæ which you see here to-day. The gases and feces of the bowel will not allow the sinus to heal. We may divide fistulæ into complete and incomplete. A fistula is complete when it leads from a normal cavity of the body to the surface. It is incomplete when it leads down to dead bone or to a foreign body. You can usually introduce the probe into the sinus and follow its course until you come to the dead bone or foreign body in case of incomplete fistula and to the normal cavity in the case of complete fistula. You can usually follow the irregular course of the sinus with the probe until it enters the bowel cavity. If there is no internal opening it is an incomplete internal fistula and if no external opening the fistula is incomplete external. In these cases there is usually a depression covered by soft granulation marking the outer extremity of the fistula. Occasionally you find great difficulty in following out the course of the fistula because of its great irregularity, and hence requires quite a little care and sometimes a little force to follow it out. The idea in the treatment of all these cases is to put the parts to rest. The walls of the sinus will then fall together and unite. We put the parts to rest by dividing the sphincter. I do not desire to make a false opening and so shall be slow in determining the normal passage of this fistula. I think I have not had occasion to say to you that there is a right and wrong way to operate in these cases. It makes no difference how the fistulæ are opened outside of the sphincter;

the incision may be oblique, but when you come to the sphincter it must be divided squarely across its fibers. You would be surprised to know how dense and hard the tissue is through which the fistula runs. I have the probe now extending through the entire fistula. You see that the external opening is a little below the internal opening, but the sphincter should be avoided squarely across so that the cicatrix will not interfere with the movement of the muscle. Another important point in the treatment of a fistula is the proper preparation of the patient before the operation. See that the bowels have been thoroughly emptied. I have the fistula in order to make it possible to keep the wound clean for the first three or four days after the operation opened into the bowels. You should follow up the bowel with the finger and be satisfied that all of the fistulæ have been opened. I have just discovered one that otherwise would have been left. Not infrequently a patient is operated on without being anæsthetized and is told by the surgeon that he will be cured. But the deep openings are not found and the man does not get well. You must anæsthetize the patient and get to the bottom of the trouble to effect a cure. I find here some foreign material, it proves to be a fish bone which has penetrated the bowel wall. I was very sure that I should because of the hardness of the parts through which the probe passed. It is well to scrape out the unhealthy granulations the same that you do in any other part. You will not always have a simple incision as this. You will sometimes find that the fistula extends around the rectum and you have what is called the horse-shoe fistula. No matter how many openings there may be in a fistula they must all be cut into one. And this should be done before opening the sphincter. After the openings are all made into one you will divide through the sphincter squarely by the most direct route. This will be packed tightly with iodoform gauze confining it to the cavity of the incision. It should be kept tight to prevent hemorrhage until the vessels have been made permanently closed, and the deep packing should not be removed until loosened by an evacuation of the bowel or by the growth of granulations. After union begins to take place, the packing should be taken out and a loose packing applied. There is no necessity for forcing the packing in after the first dressing, merely lay it in loosely.

The cavity should be carefully irrigated and repacked after every evacuation of the bowel. The patient should remain quiet in bed until the wound is nearly healed because motion interferes with its progress.

VARICOCELE.

Mr. S., age 23, German, bookkeeper.

This young man is suffering from an enlarged condition of the veins of the spermatic cord, or, as we call it, a varicocele. In this man the enlarged veins are on the left side, as is usually the case.

There are great differences in the size of the veins in different cases. Sometimes the enlargement is so great as to increase the scrotum to twice its normal size. It is a peculiar fact that the amount of discomfort from a varicocele is not in proportion to the size of the enlarged veins. Very often you will see a patient suffering very intensely with a varicocele, scarcely discernable. And again often it is not painful when the scrotum is enlarged to twice its normal size. It is very easy to make a diagnosis in these cases of varicocele examined externally; the eye can see through the thin walls the veins running in a tortuous course, and to the touch of the finger they give the feeling of a bunch of angleworms, the thickened walls causing them to be resistant to the touch. The color is characteristic. and if you will take the veins between your fingers they will resist the pressure made upon them, which they will not do in the normal condition.

The plan of treatment is the same as for variocose veins in any part of the body, the object being the destruction of the caliber of the vessels. There are various ways of doing this. Some surgeons think it best to remove a portion of the scrotum. Pressing the contents of the scrotum well up, they apply a clamp to the lower part and clip off the portion which is pulled through the clamp. In this method you see that the veins implicated are out. Others think it is only necessary to pass a needle armed with catgut through the scrotum below the veins, and around them so as to include them in a subcutaneous loop. This is not always a satisfactory method, and there are many instances on record in which extreme sloughing has taken place, causing destruction of the scrotum or its contents, and in one case at least, the patient succumbed to the septic consequences of this operation. The safe way in this day of antiseptic treatment, is to bring the diseased part into view. The thing to do is to cut down upon it, expose it and ligate it with catgut ligatures placed some distance from each other, then remove a segment of the vein between the ligatures. It has been my practice to do all of these different methods except to remove a portion of the scrotum. Now the scrotum in its normal condition is dilated by veins, and after you have divided it and have only cicatricial tissue to hold it, this gives way and your operation is a failure.

Now I have made an incision in the scrotum a little to one side. You must always make the incision a little to one side; otherwise the scar may make trouble when the organ is in a certain position. When you have exposed the spermatic cord, you will desect away the vein as I am doing, ligate above and below and make an excision of a small portion of the vein. I have now, as you see, one of the veins in my fingers. In removing these veins you will always look out for the vasdeferens, preserving it from injury. In this case I will remove as much as an inch of the vein. Now, I know that this vein will never again trouble him. The reason of the severe pain in these cases is that the weight of the enlarged veins makes pressure on the nerve supplying the testicles, and so you have a neuralgia, and an oncoming and progressive atrophy of the organ. And so when you have a condition of the veins leading to any of these conditions, you are justified in making use of one of these means to stop the trouble. Usually the destruction of the caliber of one or two of the larger vessels is sufficient to cause the circulation to pass through new channels, and the trouble ceases. I have seen some direful results from the subcutaneous ligation of vessels, not only the return circulation, but the arterial circulation was shut off, resulting in the loss of the testicle from gangrene. So I have come to the conclusion that the best way is to bring the vein into view and ligate or resect it. Usually this operation is not followed by any harmful result. Of course carefully prepare the parts, making them thoroughly aseptic, as well as the instruments, and unite the wound with a continuous cat-gut suture. There will be an exudate thrown out and the parts will agglutinate, stopping the return circulation through the old channels.

Some surgeons use silk in the operations, and others use the silver wire, while others use the cautery. But the object in all these different methods is the same—the destruction of the caliber of the vein. Usually, if you select the largest, it is sufficient, causing the circulation to take place through the other veins. Now there is danger of infection of the wound, and it is necessary to adopt some special dressing, as this is one of the most uncleanly parts of the body. We thoroughly dry the skin about the wound by washing it with strong alcohol, which we permit to evaporate. Narrow strips of iodoform gauze are then laid over the wound, and fastened along the edges by means of flexible collodion, which is applied with an aseptic brush. Each successive layer of gauze is a little larger than the preceding one, so that it will overlap the former on all sides. A pad of cotton is placed over this dressing, and held in position by a bandage, which at the same time supports the scrotum.

Gentlemen: This is the result of the operation for varicocele done before you a week ago. A large mass of veins was removed and you see that the case has done exceedingly well. There are no evidences of inflammation in the wound at all. I have said to you several times that an operation of this kind will always be a test as to whether you have made the operation aseptic in every way, for you know that this portion of the body is one of the most difficult to keep absolutely clean. When the wound heals as kindly as this has done by first intention, you are then assured that your work has been done aseptically.

Hydrocele.

Case I.—This patient comes to us with a tumor, which occupies the left side of the scrotum. On the other side we find the normal organ unaffected. This large tumor having formed in about two months' time illustrates the rapid development of an abnormal growth. The extreme rapidity of its growth argues in favor of its benignancy; no solid tumor could grow so rapidly. It is not giving the patient very much pain or distress except from its weight, and hence it is not inflammatory. There is a dragging sensation complained of when the man stands on his feet, although it is not very heavy as supported in the hand, notwithstanding it has reached such a size as this. Lightness in tumors in this position indicates fluidity of contents. I am able to determine another fact in its condition; it is a tumor that belongs entirely to the cavity of the scrotum and has no connection with the abdomen, for I find it is possible to entirely isolate the spermatic cord at the external abdominal ring, notwithstanding the size of the tumor; this cannot be done if the contents of the scrotum come from the abdominal cavity. This eliminates the possibility of the existence of hernia. Again, as I percuss it in this way, I get another sign which is present, and that is the easily distinguishable wave of fluid transmitted from one side to the side of the tumor. Hence it contains fluid. There is no growth that will give this wave transmission through a mass as large as this, except one which contains fluid. Of course, the surgeon meets with scrotal tumors, usually connected with the testicle, which contain fluid in cavities, such as broken down syphilitic gumnata or sarcoma, with cavities containing colloid matter; but these seldom reach any such size as is shown in this tumor, and are not marked in their translucency or evidences of fluctuation, and are usually of slower growth. A special constitutional history can usually be elicited in case of syphilis.

Another test of its character is that of determining its translucency, whether light will be transmitted through its walls. Sometimes this can be done by shading the eyes with the hands close to the tumor and looking through it towards a window, as can be done in this case. A better plan is to use the barrel of a large rubber syringe placed to the eye and against the tumor on one side and a lighted candle on the opposite side. If the light shows through the mass, the contents must be fluid and clear. Again the contents may be fluid and yet not clear, as in hæmatoceles, hence, translucency is an infallible sign of this kind of tumor. I am sure this is a hydrocele on account of its rapid growth, its pyriform shape, its freedom from pain, its lightness, its evidence of free fluctuation, its smooth, even contour and its translucency. Solid tumors of the testicle are nodular and uneven; hæmatocele or blood accumulated in the cavity of the scrotum, gives a history of accident or injury absent in this case. Hydrocele is caused by an inflammatory process resulting either from traumatism or from a septic or a specific epididymitis or from the fact that the process vaginalis has not been obliterated.

There are two ways of treating hydrocele—the radical and the palliative. The latter consists merely in tapping it with a trochar not infrequently a single tapping will effect a cure, especially in hydroceles in infants, but as a rule for the adult, it is necessary to do something more radical to effect a cure. I consider that the best and the surest method of all is to lay it open with antiseptic precautions, to sew the edges of the sac to the integument and to pack the cavity with iodoform gauze, which is removed from time to time and replaced in smaller quantity until the cavity is obliterated by contraction and granulation. The incision should extend to the lower end of the sac in order to prevent bagging of the veins. I have done this open operation many times without any reaction following and with perfect recovery.

This patient is not ready to have the radical operation done as yet, so we will do the palliative one and he will come in subsequently, he says, for the other.

You have in this case an illustration of the extreme elasticity of the tissues of the scrotum. It is not as large a hydrocele as the surgeon often sees. Frequently you meet with these cases in which there is no penis at all to be seen; in which there is nothing but a small opening to be found on the surface of the scrotum, through which the urine passes and no examination one can make of the mass will enable one to fix the position of the penis.

Tumors that grow in connection with the scrotum often reach an immense size; so that in doing any operation upon these tumors in which you are called upon to make division of the covering, you must always allow for extreme retraction, after the removal of the mass or its contents.

This palliative operation is said usually to be a simple affair and not attended with danger. Do not go away with any such idea. It is difficult to estimate how many fatal cases might be collected resulting from this operation. The results have been very bad many times in elderly people—even fatal, and also in hydrocele with very thick walls which prevent contraction, so you should not rashly resort to even this simple operation.

Be very careful to prevent infection, by thorough disinfection of the surface to be punctured, by washing with soap and water and with a solution of bichloride of mercury 1-1000. The trochar used should always be thoroughly washed with soap and hot water and with strong alcohol or boiled in a solution of a tablespoonful of baking soda to a quart of water before its introduction. Be careful to empty the sac slowly and without pressure, allow the fluid to flow from the gradual contraction of the scrotal walls. The patient should be recumbent. If the sac contents are not allowed to flow slowly, hemorrhage into the sac is apt to follow soon after the withdrawal of the fluid.

In tapping, select some portion which is devoid of veins and other vessels through which to thrust the trochar. Introduce the trochar perpendicularly to the mass, pushing it on until you are sure you are through the scrotal walls. Once the cavity of the sac is entered turn the point of the instrument upwards to avoid injury to the testicle; it is a triangular instrument and hence it should be introduced with a twist, as you are less likely to do unnecessary damage to any of its coverings. This fluid, notwithstanding it showed translucency very plainly when I looked through the speculum, now appears reddish in color, as we draw it off. Some accident has led to a little discharge of blood into the serous cavity, hence this color. After a kick on the scrotum, or fall, or bruise, there will sometimes come on almost immediately, an accumulation of a large amount of blood in the tunica vaginalis, as the result of a rupture of some of the blood vessels forming an hæmatocele. This fluid looks so red I am inclined to think something has recently interfered with the circulation of the sac. He has come some distance on the cars and it may be he has bruised it in some way or the point of the trochar may have wounded a small vessel in the lining of the sac. Now we get serum almost entirely without any blood in it, by changing the direction of the canula. We should have gotten through a little more quickly, of course, if we had used a larger trochar. I am glad, however that I did not do so, because we should have emptied it too quickly, which would have been in a manner a mistake because it is sometimes followed by considerable shock.

I should not be surprised to have this hydrocele refill promptly, and if so, I am quite sure the best thing the patient can do is to have it opened widely and freely. We had a case before us this winter, if you remember, in which the tumor refilled in 24 hours, mostly with blood, and we opened it by the radical operation which I have described to you, and the man was cured in a very short time. I will not allow this man to get up and go to his home at once, but will put him in his bed in the hospital at least until tomorrow morning, in a recumbent position. The sac is now empty and the canula is withdrawn while holding the scrotal walls close in contact with it. A dressing of iodoform gauze is placed over the opening and the scrotum supported in an elevated position.

Many methods for the radical cure of hydrocele, other than the free incision mentioned, have been adopted. The fact that there are so many different methods is evidence that none of them are absolutely satisfactory. All of these operations have for their object the obliteration of the sac in which the fluid is found. The plastic method is done by injecting some irritating fluid into the sac wall which will cause an adhesion of the walls. Port wine has been used,alcohol, tincture of iodine and 95 per cent. carbolic acid. In all of these cases empty the sac entirely of the fluid and fill its place with the injecting fluid; using a larger or smaller dose according to the size of the hydrocele. There is now no doubt as to the harmlessness of the 95 per cent. carbolic acid. You can scarcely believe that pure 95 per cent. carbolic acid would not produce some trouble locally; yet it does not, the only trouble that might come from it is by spilling it from the canula on to the scrotum thereby causing the patient severe pain. This excoriation can be best prevented perhaps by the use of the hypodermic needle and by thoroughly coating the scrotum with vaseline. I have treated several cases with the ordinary trochar, and having the end of the syringe filled to a fine point, it is introduced into the scrotum and the fluid is thus prevented from getting on the scrotum. It is absolutely necessary for you to be sure that the canula is in the sac, if the end of the canula has been withdrawn from the sac and the pure carbolic acid is injected in the loose connective tissue necrosis is sure to follow. Usually a drachm of the 95 per cent. carbolic acid is sufficient. If the hydrocele is as large as this one you will need to inject two drachms. The carbolic acid is not painful except a slight smarting at the time of injection. The effect will be that of a slight reddening, and in a week or two there may come on a refilling of the tunica vaginalis to the extent of an ounce or two which may be withdrawn. This is sometimes mistaken for a return of the hydrocele, but such is not the case.

The method which is most commonly resorted to consists in tapping the hydrocele and then injecting from one drachm to an ounce of the compound tincture of iodine into the sac. The sac is then manipulated thoroughly in order to bring all of its parts in contact with this fluid and then as much of the fluid as possible is withdrawn through the canula. This method although much more commonly employed than the one just described is not followed by nearly so many permanent recoveries and it is much more painful. One can, however, overcome the painfulness of this procedure by thoroughly irrigating the cavity through the canula with a 2½ per cent. sol. of carbolic acid by filling and emptying the cavity a dozen times in succession and then applying the injection of the tincture of iodine. The carbolic acid irrigation seems to anæsthetize the tissues. When you come to read about these cases, you will read the clinics of surgeons who have held their positions in the same hospitals for a number of years and they will say that all of these methods fail. The patient may think that he is cured, and perhaps five or six years will elapse before the trouble returns, consequently these so-called radical cures are not always cures.

It should always be borne in mind that all methods carry with them much danger from sepsis if the precautions mentioned concerning the field of operation and especially the preparation of the trochar are not taken to prevent its occurrence.

Hydrocele in an Infant.

Case II. Charles, 9 Center Ave., age 3 months, American.

Does the lump get larger when the baby cries? It does not. How long has the lump been there? One month. This little baby comes with an enlargement of the right side of the scrotum about the size of a pigeon's egg. It is translucent and transmits the sensation of a fluid to the touch. I can isolate the spermatic cord. The tumor does not increase in size when the child cries. Compression does not diminish its size. Hence we have the ordinary signs of a hydrocele.

We have three varieties of hydrocele: hydrocele of the hernial sac; hydrocele of the cord, and hydrocele of the tunica vaginalis.

You should be very careful about the diagnosis in infants for you will very often find a congenital hernia in which a process of the peritoneum, containing fluid, extends into the scrotum. You can determine if this be true by lifting the scrotum up and by shaking it, the fluid flows back into the abdominal cavity. It is necessary to distinguish between these two troubles, for we do not wish to make an operation for the radical cure of hydrocele when there is a communication between the abdominal and scrotal cavities. Neither do we wish to inject fluids into the scrotum which might enter the abdominal cavity and cause peritonitis. If there is a doubt about the diagnosis, it can be determined by the hypodermic syringe. I use the hypodermic syringe in this case not only to assist me in the diagnosis but also to draw off the fluid. We will advise the application of the saturated solution ofmuriat eof ammonia and see if that will not reduce it.

You see that I get here the straw colored fluid that belongs to a hydrocele. The treatment for hydrocele in children does not differ materially from that of adults, but usually the simple method of tapping followed by the application of hot saturated solution of muriate of ammonium will be followed by permanent relief. If this fails the injection of a few drops of a 95 per cent. solution of carbolic acid will almost always result in a permanent recovery.

APPENDIX.

REGULAR SURGICAL CLINIC AT RUSH MEDICAL COLLEGE, CHICAGO, OCTOBER 15, 1889.

CASE I. Mrs. H., Chicago, age 44, American, housewife.

Gentlemen:—This patient you will recognize as the one upon whom we performed vaginal hysterectomy, three weeks ago, for cervical carcinoma. She is perfectly well and desires to leave the hospital.

You will remember that the broad ligaments before division were secured by means of two pair of long-jawed forceps, for the purpose of preventing hemorrhage, and no ligatures were used; and you will also remember that very little blood was lost at the time of the operation. The operation was finished at 2:30 P. M.; the patient was returned to the hospital and put to bed. She rested very comfortably until about 8 P. M., when she was seized with severe vomiting, and this was followed by profuse hemorrhage from the vagina. I saw her within a few moments after its occurrence, exposed the parts and ascertained the cause of the hæmorrhage to be from the slipping of a part of the tissues grasped in the forceps placed upon the left broad ligament, which undoubtedly let free the uterine artery. The cause of this accident was the succession of the vomiting secondarily; primarily it was rendered liable for the following reasons, viz: The use of the strong-jawed forceps is followed by a slough of all the tissues included in their grasp. This slough is slow in separating, gives rise to rather a foul discharge, and is accompanied with some danger of infection. With the intention of avoiding these conditions I attempted to apply this pair of forceps more loosely than heretofore. My idea was to make just enough pressure to control the bleeding, and not enough to kill the tissues included in the grasp of the forceps; hence I fastened it only by the first catch instead of shutting the handles down to the third notch. This controlled the hæmorrhage, but as soon as the straining of the vomiting came on the tissues pulled out of the grasp of the forceps and bleeding occurred immediately. Without anæsthetizing the patient an attempt was made to seize the bleeding vessels with other forceps, and believing that I had been successful I left the patient. Within half an hour I was informed that the bleeding had recurred as badly as ever. The patient was now anæsthetized and the parts thoroughly exposed, but no bleeding artery could be found. The entire surface and cavity were now thoroughly packed with strips of iodoform gauze and bleeding did not recur. The forceps were all removed at the end of forty-eight hours. The packing was gradually removed from day to day. The patient went as rapidly to recovery as if the hæmorrhage had not taken place. All things considered, it is perhaps the best plan to clasp the forceps as tightly as possible. Excessive hæmorrhage does not always retard the recovery of patients, although it should be the rule to use every precaution to prevent its occurrence.

Case II.—Mrs. G., Baraboo, Wis., age 28, American, housewife. This patient, whose family history and previous history are good, has suffered for six months from some abdominal trouble. Inspection of the abdomen shows a decided bulging below the line of the umbilicus. Palpation determines the presence of a hard movable mass about the size of a cocoanut in the left lumbar and umbilical regions. Fluctuation is easily recognized. Below this mass, entirely across the body, percussion gives flatness everywhere except in the upper zone of the abdomen. Vaginal examination elicits the fact that the uterus is of normal size, retroverted and probably free from the mass above.

Diagnosis: Multilocular ovarian cyst, for the removal of which we will do a laparotomy. An incision 4 inches long is made in the median line through the abdominal walls between the umbilicus and the pubis. This incision should always reach near to the pubis, so that when the tumor is delivered the pedicle can be easily handled and managed. It should be made quickly through the tissues of the abdominal walls down to the transversalis fascia without the use of a director, the eye recognizing the different tissues as divided. A good guide for the place of the incision is the dark line to be recognized in the skin between the umbilicus and the pubis directly over the course of the linea alba.

When the transversalis fascia is exposed it should be seized with a pair of dissecting forceps in the hand of your assistant and another pair in your own hand at points one-half inch from each other, and be lifted up from the subjacent tissues and then freely divided with the knife. This will expose the peritoneum, which should be seized in the same manner and also lifted away from subjacent tissues and freely incised. This can be done with safety and without fear of injuring the sac, or intestine, or omentum, or whatever else may be beneath it. Now, while talking to you these steps have all been taken and here is an opening in the peritoneum, out of which flows a little peritoneal fluid, warning us of the fact that the peritoneal cavity has been reached. Through this opening I can see the white glistening surface of an ovarian cyst; and this is the sight which always gladdens the heart of the operator, for when he sees this white glistening tissue he knows that he has an ovarian cyst to deal with. The diagnosis is confirmed, as all other outgrowths of the uterus and its appendages are reddish in color. The opening in the peritoneum is now enlarged to the full extent of the opening through the abdominal walls by means of the scissors, using the fingers in the abdominal cavity as a guide to avoid wounding the intestines, or omentum, or bladder, should they be in the way. The cyst wall now comes up freely in the wound, so that it can be seen in all parts of the room. Some authorities advise, and many operators practice at this stage of the operation, the plan of introducing a sound or the hand into the abdominal cavity and over the surface of the tumor for the purpose of ascertaining and locating adhesions. I do not think it a good plan and never practice it. No attempt to separate adhesions should be made until they can be seen and are under perfect control, and this can be better done after the sac is emptied and its surface, with the adhesions, is drawn to the opening in the abdominal wall. The tumor is now held firmly against the abdominal opening by pressure from the assistant's hands from above and behind, which is kept up until the sac is entirely emptied. In this way the sac is kept in close contact with the edges of the wound, filling it entirely, so that no leakages of the contents of the sac can find their way back into the abdominal cavity. A large trochar, to which a rubber tube is attached, is plunged into the sac and the contents allowed to flow into a proper receptacle. Allow the contents to flow out slowly. As the tension of the sac wall diminishes, pressure from behind brings it through the wound, so that it can easily be seized with a pair of Neleton forceps and drawn out through the opening. As more and more of the sac comes out, there come into view different adhesions. Here, for instance, is a fold of omentum firmly adherent to the sac wall. It is secured by transfixion with a needle armed with a double ligature and tied in two sections; the ends of the ligatures are cut short. The omentum is cut through close to the tumor with the scissors. The cut surface is carefully examined to ascertain that the vessels are perfectly secured. If found satisfactory the stump is dropped into the abdominal cavity; if not, it is tied again. A sponge is placed under the omentum before division, to prevent any blood from entering the peritoneal cavity. Soft and recent adhesions are pressed off the surface of the tumor by means of a sponge. Vascular and old adhesions should always be ligated in two places and cut between them. And now,by a rather free pull,I have succeeded in forcing through the abdominal wound the large mass which was felt through the abdominal wall,and I find it to be an aggregation of multitudes of small cysts, rather unusual in its situation in being at the top of the tumor. Usually such accumulations are found near the pelvic portion of the tumor. The entire mass is now delivered, bringing the pedicle in plain view. It is made up of the expanded broad ligament and the Fallopian tube, much enlarged, running along its free margin over the surface of the tumor, and here we meet with a complication which must be handled with great care. A fold of the small intestine is firmly adherent for a distance of 2 inches along the edge of the pedicle. The tissues of the broad ligament, one-half inch away from the surface of the intestine, is transfixed with a needle armed with a double ligature, tied in halves, and the intestine cut away from its adhesion. The pedicle is now grasped in these long forceps and the tumor cut away.

The next point is to secure the pedicle. It is transfixed through its middle, selecting a non-vascular point, with a rather blunt needle armed with a double ligature of strong silk. The needle is detached, the threads are crossed, drawn around the halves of the pedicle and tied tightly, always removing the forceps before the knot is fastened, to be sure that the vessels are controlled by the ligatures. If all is satisfactory, the ends of the ligatures are cut short and the pedicle is dropped into the abdominal cavity, remembering never to pull upon the ends of the ligatures after they are tied, for fear of loosening their hold.

Now the abdominal cavity is to be cleansed thoroughly of blood and anything else that may have collected. The intestines are held out of the cul-de-sac of Douglas. These small sponges, fastened to handles, are used to remove thoroughly any discharge that may have gravitated into it. We are now ready to close the abdominal wound as soon as the omentum is pulled down over the surface of the intestines. A large flat sponge is introduced into the abdominal wound to protect the intestines and catch the blood coming from the needle punctures. The sutures for closing the abdominal wound are passed through the skin about one-half inch from the edge of the wound and include all the tissues of the abdomen together with the peritoneum. About three sutures for every inch in length of the wound are introduced in this manner. Now a very important duty, and one never to be neglected, is to be performed, and that is to account for all the sponges that have been used during the operation. The flat sponge is now removed and all the sutures tied, being sure to perfectly approximate the edges of the skin, so as to provide for early and secure healing and thus avoid, as far as possible, the dangers of the occurrence of ventral hernia. The wound is dressed dry with iodoform, iodoform gauze, borated cotton and a firm abdominal bandage. The patient is put into a bed warmed with bottles of hot water, the limbs are flexed over a pillow, and the shoulders are raised to relax the abdominal walls. The artificial heat is kept about the patient until reaction is fully established. No medicine of any kind is administered unless opium is required to relieve severe pain. I think this is best done by rectal injections of 30 drops of deodorized tincture as often as is necessary to control the pain. No food whatever is given for twenty-four hours. If vomiting is present, it is usually readily controlled by giving teaspoonsfuls of very hot water. The bowels are moved on the third or fourth day by giving teaspoonful doses of epsom salts every four hours until the result is obtained.

Unless the temperature rises to 102° F., accompanied with other symptoms of trouble, the patient will not be disturbed in any way except as mentioned until the seventh day, when she will be brought before you and the stitches removed.

About the only preparation I make of my patients—and it is absolute with me—is to have the patient quiet for three days before the operation, on liquid diet, and to have the bowels thoroughly and effectually emptied of their contents by proper cathartic medicines. Twenty-four hours before the operation the patient has a general bath and a large 1-1000 corrosive sublimate douche, followed by a large hot water douche to disinfect the vagina. The abdomen is thoroughly scrubbed and shaved, and an antiseptic dressing is applied, which is left on until the time of the operation. Five grains of quinine with one-fourth grain of morphia are given by mouth one-half hour before operation.

Without accident this lady will not be confined to her bed more than three weeks, and if all goes well she will be able to return to her home by the end of this time. A peer of the English government, during the ceremonies incidental to the laying of the corner-stone of a hospital, a few years ago, made the statement that Sir Spencer Wells had added 20,000 years to women's lives by the performance of such operations.

Notwithstanding the fact that the great majority of patients subjected to laparotomy for ovarian cysts when properly cared for, recover, still when asked if there is any danger attending the operation, be honest enough to say that there is danger.[1]

Case 3.—Miss E. A., Chicago, age 32, American, musician, general health good. This patient presents herself to us with a small painful tumor as large as a bean, on the back of the hand, between the second and third metacarpal bones. It has developed within the last six months, after prolonged piano practice.

It is a neuroma, and requires removal. The lady bravely consents thereto without taking an anæsthetic. It is exposed by a short incision directly over it, picked up with a pair of forceps and dissected away. Two catgut sutures, iodoform, iodoform gauze and borated cotton dressing complete the operation.[2]

Case 4.—J. C. H., Stonington, Ill., age 48, American, farmer. Family history good, patient well until he entered army at age of 20. This patient has had slowly but constantly increasing symptoms of locomotor ataxia, probably caused by exposure during three years' service in the war.

But he appears before us to-day for relief from disabling disease of the right knee-joint, which you can plainly see is very much enlarged and misshapen. Fourteen months ago he first noticed an unusual snapping and grinding in the knee during motion. There came on swelling of the knee and of the leg below as far as the ankle. The swelling of the leg gradually subsided, but the knee remained swollen and its distortion gradually increased, until now an examination shows it to be completely disorganized, movable in all directions, the ligaments apparently destroyed and every motion made in it accompanied with harsh, rough grating. It is also filled with fluid, which upon aspiration is shown to be reddish serum. He has had amazingly little pain in the joint itself, when one considers the amount of apparent destructive changes that have taken place. Yet he has complained, and does complain, of severe shooting pain throughout the leg, and especially in the upper one-third of the tibia, which you can plainly notice is much enlarged. The shooting pains spoken of are common to and characteristic of this general disease, for I take this to be clearly a case of Charcot's disease of the joint, a condition not infrequently present as a complication of tabes dorsalis. It is so named because Professor Charcot, of Paris, was the first one to thoroughly describe it. The most noticeable peculiarity about the disease is well illustrated in this case, in which these most destructive changes have taken place without correspondingly severe manifestation of their progress.

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[1] The stitches were removed on eighth day, union throughout. Temperature has not reached 100° F., has felt comfortable, can move about in bed, and sat up on fifteenth day.

[2] The wound is dressed on the eighth day and found perfectly healed. The pain has disappeared.

Believing the patient will be best relieved of his trouble by an amputation of the thigh through the middle, we will proceed to do that operation.

The limb was removed by forming the ordinary anterior and posterior flaps by transfixion. No antiseptic fluids or washes of any kind were used on the stump; it was dressed with dry dressing, iodoform, iodoform gauze and borated cotton. The thigh had been rendered thoroughly aseptic before the operation.

The joint was opened and displayed to the class; it displayed the characteristic appearance of a Charcot's joint—the fluid sanguineous, the articular ends of bones enlarged, that of the tibia being worn off as by a grindstone and much hardened.[3]

Case V.—Miss R., Chicago, æt. 25, American, flower girl. General condition fair, family history good. This patient is suffering from persistent and apparently uncontrollable pain following excision of the knee for tubercular disease. The excision has been a perfect one and the recovery is complete, but the patient is prevented from following her avocation and demands an amputation of the thigh, in spite of advice and protests of physicians and friends.

Two operations for the purpose of dissecting out nerve fibres compressed in the cicatrices left after the excision have been made, but these failed to give relief. The amputation will be made as low down on the thigh as possible by means of two skin flaps formed from without inwards and a circular division of the muscles just above their base. You notice that in dissecting up these flaps I am very careful to take up with the skin the full thickness of the superficial fascia beneath it. This is to provide for the flap's nourishment. The blade of the knife is always made to cut transversely to the limb's axis in severing the tissues. In all flap amputations the sum of the lengths of the two flaps should be about 2 inches longer than the full diameter of the limb at the seat of section of the bone, so that they may be free from any tension or harmful retraction, and also to avoid a conical stump when the healing is complete. The amputation was made as described and dressed as the previous one. You will notice that in both amputations the flaps are approximated by continuous catgut sutures which bring the skin edges together neatly and accurately throughout the entire length of the wound.[4]

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[3] The patient was brought in on the eighth day and showed to the class for first dressing The wound had healed throughout by first intention.

CASE VI.—J. F., Chicago, æt. 3 years, poor health. This child comes before you with a well marked swelling of the dorsal surface of the hand principally covering the head of the metacarpal bone of the middle finger. The trouble is uncertain in character. An incision over the surface of it demonstrates it to be a tubercular abscess, connected with tubercular degeneration of the head of this metacarpal bone. I will proceed to curette the cavity freely and remove the particles of dead bone. It will now be washed clean and packed with iodoform gauze and the wound covered with borated cotton*

CASE VII.—Otto B., Missouri, æt. 15. This is a well-marked case of talipes equinus following infantile paralysis. There evidently has been an arrest of development in the right lower extremity of this patient, for it is much smaller in every way than the other one. The activity of the muscles has been restored, but in all probability his attempt to equalize the length of the limbs has been an element in the extreme contraction of the muscles attached to the tendo Achilles. All we can do in this case is to divide this tendon and place the foot at a right angle with the leg and fix it in that position by a plaster of Paris cast. This brings the side of the foot of this diseased leg two or three inches above the ground when he stands erect on the sound leg, so he will be compelled to wear a shoe sufficiently elevated to make the limbs of equal length. This will enable him to walk with much more ease and comfort.

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[4] On the eighth day the patient was brought before the class for the first dressing. Wound united, patient had been perfectly normal and free from pain ever since operation.

*Wound perfectly healed at end of five weeks.

In dividing the tendon Achilles introduce the tenotome through the skin an inch away from the edge of the tendon; pass it subcutaneously either above or below the tendon while it is relaxed; turn the cutting edge toward the tendon rendered tense by forcible flexion of the foot. A slight pressure upon the knife will divide the tendon readily. It is well to choose the narrowest part of the tendon for its division. It is important to avoid wounding the posterior tibial artery. All of this is done and you now see the foot comes easily to a right angle with the leg, and you notice as well the deep depression in the course of the tendo Achilles caused by the separation of the divided ends. This space will be filled up with connective tissues and the function of the tendon restored.[5]

CASE VIII.—Mrs. Catherine M., Chicago, æt. 52, Irish, housewife, general appearance good. This case presents for inspection an angry-looking growth about the size of a bean, situated over the triangular cartilage of the left side of the nose. The patient tells us it is growing larger and becoming more irritable. I deem it to be an old wart taking upon itself epitheliomatous degeneration. Its removal is advised and consented to. The tumor is included in an elliptical incision far enough away to be in healthy skin. Its depth extends entirely through the thickness of the skin.

The edges of the resulting wound are easily approximated by two sutures, making a linear scar entailing no deformity, dressed with iodoform gauze.[6]

CASE IX.—A. T. J., Chicago, American, drug clerk. This young man presents himself with a swelling as large as a good-sized potato and very similar in shape, on the posterior surface of the upper part of the right leg. The growth evidently pushes all the muscles of the calf in front of it. It is hard and irregular to the touch where it can be felt underneath the edge of the muscles. It causes no pain or inconvenience except from its size. It evidently is an outgrowth, bony in character, from the posterior surface of the upper part of the tibia. It belongs to the class of innocent tumors and is technically called an exostosis. I cannot advise any operative procedure so long as it is harmless in its manifestation. Should it at any time become a source of trouble through increased enlargement I think it can be safely removed

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[5] At end of two weeks cast removed, position perfect. Cast reapplied, to be left on for three months.

[6] On eighth day wound is united throughout.

CASE X.—Mr. Wm. V., Chicago, æt. 47, English. This patient shows his hand with the little and ring fingers flexed into the palm of the hand and fixed in that position, When I attempt to extend them and examine the palm of the hand beneath them I feel very readily a distinct band rise up under the palmar skin. This band is rendered very tense at every attempt at extension of the fingers. On either side of these bands are to be seen several small dimple-like depressions in the skin. This trouble is technically termed a case of Dupuytren's contracted fingers, and is a deformity resulting from injury to the fascia of the hand which produces a contraction of the connective tissue in and about the deep fascia. Its tendency to contract flexed the fingers and holds them immovable in this abnormal position.

The flexor tendons are not primarily concerned. The trouble was named after Prof. Dupuytren because he was the first to accurately describe the pathological conditions.

To overcome this deformity we introduce the tenotome and divide all of these resisting bands met with in succession as the fingers are forcibly extended. This is all done subcutaneously, as you plainly see; the hand in the first place having been rendered positively aseptic. The wounds are dressed with iodoform and iodoform gauze and the fingers bandaged in an extended position to a well padded splint.[7]

CASE XI.—J. W., Chicago, age 30, Scotchman, machinist, generally healthy, well nourished. On examination we find that this man has a mass taking the place of the left epididymis of the same size and shape and of a cartilaginous hardness. Cases of this character and presenting this special feeling have in my experience proven to be tubercular. Based upon that belief this affection, however slight and simple it may seem to be, is of serious import to the patient. While it is present it is a constant source of danger from possible general tubercular infection. The only reasonable treatment to advise or pursue is total extirpation of the diseased organ. The patient does not consent to any such interference, and I did not expect him to, still I am quite well convinced that it is the safest procedure to adopt in this case, and is my duty to warn him of the risks he runs with this centre of disease in his system.

As he will not consent to the operation suggested, we will prescribe such medicines as are supposed to have a beneficial influence on this disease. Bichloride of mercury $\frac{1}{64}$ of a grain, three times a day.

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[7] Two weeks after the above operation the little finger is in the extended position and movable. In the ring finger full extension is still not possible on account of a few more bands, which will shortly be divided.

Case XII–XVII.—The six patients now shown to you are all illustrations of the enlargement of the thyroid gland, technically termed goitre, or bronchocele or struma.

The points in diagnosis are, first, its position in front of the neck; second, its shape, spread eagle, a small body in the center and large wings on either side; third, it rises and falls with each act of deglutition, as I illustrate with this patient, because it is normally fastened to the trachea.

The growth may be unilateral, bilateral or central, according as one or both lobes or the isthmus, or all three are the site of the manifestation of the disease. The growth may be cystic, single, or multilocular, adenomatous, vascular, or fibrous; or the tumor may be a sarcoma or a carcinoma of the thyroid gland. Again, we are often called upon to treat cases of enlargement of the thyroid gland associated with bulging of the eyeballs and distressing pulsation of the large arteries of the neck. Such cases are termed exophthalmic goitres.

The cases before us are all examples of cystic or adenomatous enlargement of the thyroid. We have fallen into the habit of treating these cases by the weekly injection into the substance of the gland of a drachm of the 5 per cent. sol. of carbolic acid in water. This treatment is followed by a rapid diminution in size in many cases, and a perceptible improvement in all who have regularly returned. I have added to this treatment the use of 5 drop doses of Donovan's sol. three times a day, with what benefit I am not yet able to state.

Case XVIII.—This patient returns to show the result after removal of two-thirds of the lower lip for epithelioma. The wound is perfectly healed and the deformity of the mouth very slight, when you consider how much tissue was removed.

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